G69
7:2002

Digitized by the Internet Archive
in 2014

https://archive.org/details/coastwatch00uncs_15

G69
7. 2002/4

MOCKS BEACH • SHUCKING OYSTERS • FISH ANTIBIOTICS

Coastwatch

North Carolina Sea Grant • Winter 2002 • $3.75

N.C. DOCUMENTS
CLEARINGHOUSE
JAN 16 2002
STATE LIBRARY OF NORTH CAROLINA
RALEIGH

Pondering the Pound Net

Full Steam Ahead

By now, we are getting used to writing 2002 on various documents. For the new year, some of you may have made personal "resolutions," while others are assembling lists of "action items."

One North Carolina Sea Grant project this year will be an update of our presence on the World Wide Web. Use of the Internet has grown in recent years, and we recognize a need to provide rapid access to information on Sea Grant topics.

But, we also realize that more traditional forms of communication — including printed newsletters and magazines, books and brochures, as well as videos and other formats — continue to play important roles in conveying information.

In every communication effort, including the Web, we look at content, audience and presentation. We will provide more information from extension specialists and university researchers via the Web. We also will strive to make it easier for the public — teachers and students, property owners and public officials — to find information on our site.

Our Web committee includes Sea Grant staffers and members of our Outreach Advisory Board, who represent members of the public that use Sea Grant resources. We will seek input from a wider audience as well — and *Coastwatch* readers can help. For example:

Why do you choose the Web as an information resource?

What coastal topics do you include in your searches on the Web?

Do you look for broad topics, such as water quality? Or do you seek specific information, such as how to build a rain garden to filter stormwater runoff?

What elements of a Web site make searches easier? Can you identify specific sites that are easy to navigate and offer useful information? Give examples.

Are you likely to download or print specific pages or simply read the items on screen?

The answers to these questions can help us develop a better site. So, if you are stuck inside on a blustery winter day, I ask you to think about your needs for coastal information. Drop me an e-mail at *katie_mosher @ncsu.edu* with your answers to these questions and other comments on the Web.

Herman Lankford

Looking ahead in 2002, we also will offer some new topics in *Coastwatch*. In the past year we have given you more stories on Sea Grant-funded projects, including research on menhaden and corals. This year, we anticipate stories on Sea Grant projects in the social sciences — such as sociology, anthropology, demographics and economics — alongside stories on water quality and coastal erosion.

For example, Jeffrey Johnson of East Carolina University and Mike Orbach of Duke University have looked at the role of "networking" in the development of policy. They found that individuals may vary in their view of how an overall network is structured — and how they, personally, fit in.

But one conclusion was clear. "If you are powerful, you must have a high level of knowledge of the network," Johnson says. "People who are powerful know who is connected to whom and how. They are very astute at that."

In addition, the most influential members of a network often are those who can provide a link between groups that otherwise would not be connected, Johnson says.

Another Sea Grant project will look at the changing demographics in the coastal counties. As retirees increasingly choose a coastal lifestyle, how are communities responding? As the number of Hispanic immigrants increases in urban regions, is there a similar increase at the coast?

And amid all this change, who are making decisions and setting policy on coastal topics? From time to time, we will introduce readers to elected and appointed leaders, who may explain how they sort through difficult policy decisions. Or, they may describe the people and places that have touched their lives.

In this issue, we feature Marc Basnight of Manteo, president pro tempore of the North Carolina Senate, who shares some of the lessons he learned in his youth on the Outer Banks.

Of course, we will continue to offer stories on all aspects of the coast. In this issue, you will meet pound netters pondering their future and researchers announcing cutting-edge findings on natural antibiotics. And we take you along for visits to Hammocks Beach and Bear Island. Enjoy this winter visit to the North Carolina coast.

Katie Mosher, Managing Editor

CONTRIBUTORS

Writers:

Ann Green ▫ Katie Mosher ▫ Pam Smith

Photographers:

Aycock Brown ▫ Nancy Cowal ▫ Michael Halminski ▫ Herman Lankford ▫ Katie Mosher
Ken Taylor ▫ Scott D. Taylor ▫ Doug Smith ▫ Pam Smith ▫ Drew Wilson

Coastwatch

FEATURES

COASTAL TIDINGS 2

BEAUTY IN THE EYE OF THE BEHOLDER:
HAMMOCKS BEACH STATE PARK
Join Pam Smith for a day at Hammocks Beach State Park and its crown jewel, Bear Island. The trip inspires many visitors to count the park's natural wonders. 6

LIFELONG LESSONS:
COASTAL THEMES RESONATE
As president pro tempore of the North Carolina Senate, Marc Basnight often turns back to the childhood lessons learned while watching the cycles of nature on the Outer Banks. 11

POUND NETTING:
RICH FISHING TRADITION SEEING DECLINE
Some fishers are pulling up their pound nets because this traditional fishing style is so tedious and time-consuming. Ann Green talks with veteran pound netters on the Pamilco Sound and Chowan River. Meanwhile, Katie Mosher introduces a Manns Harbor retiree who shares stories of life on the water. 16

MARITIME MORSELS:
Shucking Oysters, Clams Like a Pro
Environmental health specialist Wayne Mobley demonstrates how to use a knife properly when shucking oysters and opening clams. With those lessons in hand, it will be time to try some shellfish recipes from Joyce Taylor. 21

SEA SCIENCE:
Researchers Conduct Breakthrough Studies on Fish Antibiotics
North Carolina Sea Grant researchers have discovered a new, naturally occurring antibiotic in hybrid striped bass that may have implications for treating diseases in humans and animals. 23

NATURALIST'S NOTEBOOK:
Field Notes from Bear Island
A group of North Carolina State University students set out to "discover" Bear Island as part of a class taught by North Carolina Sea Grant specialists Lundie Spence and Walter Clark. 26

Coastwatch

Managing Editor
Katie Mosher

Senior Editors
Ann Green
Pam Smith

Contributing Editor
Cynthia Henderson

Designer
L. Noble

Circulation Manager
Sandra Harris

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 15-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina. *Coastwatch* (ISSN 1068-784X) is published six times a year by the North Carolina Sea Grant College Program, North Carolina State University, Box 8605, Raleigh, North Carolina 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. Subscriptions are $15. E-mail: katie_mosher@ncsu.edu World Wide Web address: *http://www.ncsu.edu/seagrant* Periodical Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch*, North Carolina Sea Grant, North Carolina State University, Box 8605, Raleigh, NC 27695-8605.

Front cover photo of pound net poles and Table of Contents photo of boat by Michael Halminski. Printed on recycled paper.

COASTAL TIDINGS

Scott D. Taylor

Aquaculture Development Conference Set

The North Carolina Aquaculture Development Conference will be held Jan. 17-19 at the Atlantic Beach Sheraton.

The program includes farm tours, workshops and presentations designed to help start-ups and established fresh and saltwater operations. Luncheon keynote speaker Dan Wilkerson, agricultural reporter for WRAL-TV, will look at "Aquaculture Across North Carolina."

North Carolina Sea Grant aquaculture specialists Skip Kemp and Marc Turano will share their expertise during panel discussions on Friday and workshops on Saturday. Kemp will present "An Overview of Shellfish Aquaculture." Turano will discuss "Crab Shedding Technology."

Other presenters include David Vaughan, director of the aquaculture division of Harbor Branch Oceanographic Institute, Fort Pierce, Fla. Vaughan will talk about the developing clam culture industry in Florida.

For additional information, or to register, contact Rebecca Dunning, N.C. Dept. of Agriculture and Consumer Services, at 919/513-0452. Or, on the Web, go to *www.ncaquaculture.org.* — P.S.

In the Next Issue of *Coastwatch*

If you build them, fish will come. Pam Smith explores the deployment of artificial reefs — the recreational anglers' watery field of dreams. The sunken material is said to transform barren ocean bottom into productive fish habitat.

Temporary closures of shellfish beds create economic hardships for North Carolina shellfishers. Cynthia Henderson talks with families about the impacts.

Show Highlights Fishing Heritage

The annual N.C. Commercial Fishing Show has long been a chance for fishing families to catch up with each other and see the latest gear. But organizers say the event is more than a just a trade show – it's a chance for the public to learn about commercial fishing, an integral part of the state's coastal economy and heritage.

"In 1952, when the organization started, public education was far from our minds," says Jerry Schill, president of the North Carolina Fisheries Association. "In the past 50 years, the state has become more urban. That makes public education efforts more critical these days."

The fishing show will be Feb. 22-23 at the Riverfront Convention Center in New Bern. And it will be just one part of the NCFA 50th anniversary celebration in 2002.

North Carolina Sea Grant started the fishing show as an extension project, but turned it over to the fishing groups. This year, fisheries specialist Bob Hines again will coordinate a series of seminars, many of which will feature results from Fishery Resource Grant (FRG) projects. Members of the fishing and seafood industries initiate the projects. The seminars will be on Saturday, Feb. 22.

Sea Grant also will work with the educational activities that will be available for youngsters ages 4-15 on Feb. 22.

For more information on the fishing show, call 252/633-2288 or go to the NCFA Web site, *www.ncfish.org*. The seminars also will be listed on *www.ncsu.edu/seagrant*. – K.M.

Scott D. Taylor

Fishing Families Honor Their Own

Members of the North Carolina Fisheries Association took time to honor commercial fishing families' leaders during the16th Annual Fish Baron's Ball held in November.

Will Etheridge III was tapped for a Highliner Award. The Dare County native was cited for "his unselfish service to commercial fishing families of North Carolina" by his active involvement and political activism in behalf of the NCFA. Etheridge was featured in a High Season 2001 *Coastwatch* story on Wanchese.

Janice Smith of Atlantic, and her late husband, Billy Smith, also received a Highliner Award. They were cited for their service to NCFA fishing families through financial support to the association for over half a century. – P.S.

Michael Halminski

Coast Guard Lifeboats Equipped for Speedy Rescues

When *U.S. Coast Guard Motor Lifeboat 4725-A* heads out for a rescue mission off Oregon Inlet, it is ready for rough conditions.

"Our lifeboats at Oregon Inlet have never rolled over," says Eddie Eacho, a U.S. Coast Guard boatswain's mate third class. "If a lifeboat does roll over, it will turn back over in eight to 12 seconds. The boat is sturdy and can go into a 20-foot breaking surf."

At the Oregon Inlet station, two state-of-the-art 47-foot lifeboats are moored at the dock, ready to conduct rescue efforts.

Both $1.5 million boats, which have been operating at the station since 1999, can speed through the water at up to 25 knots and have seven water-tight compartments. In addition, each boat, which holds up to five survivors, is equipped with heavy weather seatbelts that prevent the crew from falling overboard. Pumps can remove up to 200 gallons of water per minute out of sinking boats.

"Our main goal is personal safety first," says Eacho.

The Oregon Inlet station averages 150 search and rescue cases and 145 law enforcement boardings a year, according to Eacho.

For more information about the Coast Guard, visit the Web: *www.uscg.mil.* – A.G.

Protecting Water Quality

The North Carolina Coastal Federation will present a workshop, "Best Management Practices for Protecting Water Quality in Coastal Communities," Feb. 26 - 27, at the Riverfront Convention Center in New Bern.

The workshop, funded by the U.S. Environmental Protection Agency, targets interested citizens, educators, resource planners, engineers and local government staff and officials.

Featured speakers include Randall Arendt, vice president for conservation planning with the Pennsylvania-based Natural Lands Trust. Arendt is a nationally known conservation designer. Critics hail his book, *Growing Greener*, as "valuable for the interested citizen or public official, as well as the developer or planning professional."

Water quality experts from EPA and other national, state and local agencies will also focus on stormwater management — a timely issue in light of the implementation of Phase II of EPA's National Pollution Discharge Elimination System.

New rules require local governments to develop programs to reduce the discharge of storm water pollutants and satisfy water quality standards of the 1972 Clean Water Management Act. Phase I targeted large cities and other major "end-of-pipe" discharge sources.

The workshop registration fee of $30 covers the cost of materials, lunch and reception. For information, contact the N.C. Coastal Federation at 252/ 393-8185, or *laurenk@nccoast.org*.

— P.S.

Elizabeth City State University Wins Environmental Grant

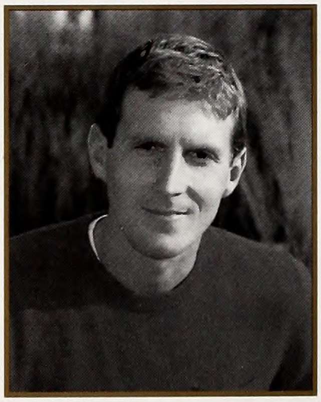
Elizabeth City State University has received nearly $300,000 from the National Oceanic and Atmospheric Administration's Environmental Entrepreneurship Program. The funds will support the university's research and remote sensing work in developing the North Carolina Coastal Habitat Protection Plans.

The grant is one of 10 awarded by NOAA as part of its newly established initiative, the Educational Partnership Program with Minority-Serving Institutions. The goal is to support educational experiences that combine coursework with hands-on opportunities in environmental sciences.

For more information about NOAA's Educational Partnership Program with Minority-Serving Institutions, go to *www.ofa.noaa.gov*, and follow the links. — P.S.

Sea Grant Names Two Knauss Fellows

Angela Corridore



Jeremy Potter

Angela Corridore and Jeremy Potter, graduate students in Duke University's Nicholas School of the Environment, are new Dean John A. Knauss Marine Policy Fellows.

The one-year fellowship, sponsored by the National Sea Grant Program, places scholars in a variety of federal government offices. Fellows learn about national policy-making processes that affect the ocean, coastal and Great Lakes resources.

Corridore, who is from Alexandria, Va., completed a master's degree in environmental management, with a concentration in coastal management. She earned a bachelor of science degree in biology and environmental science from the College of William and Mary.

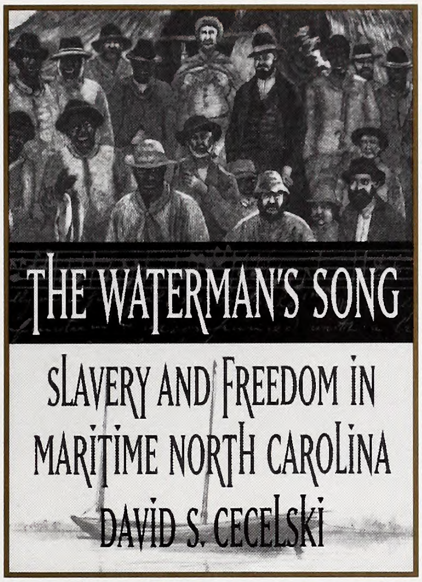
For her master's project, Corridore evaluated the socioeconomic impacts of temporary shellfishing closures. She designed a survey and conducted in-depth interviews with 50 shellfishers. Her project could become a model for a broader-reaching survey.

Potter, who comes from Morganton, W. Va., is completing his master's degree in environmental management, with a concentration in coastal conservation and policy. He earned a bachelor of science degree in biology from Davidson College, and completed post-baccalaureate studies at West Virginia University.

Currently, he is helping to characterize the Pacific and Atlantic bycatch in the pelagic longline industry. Fluent in the Japanese language, he will identify research partners in Japanese academia, government and industry. — P.S.

The Waterman's Song

In his new book, *The Waterman's Song: Slavery and Freedom in Maritime North Carolina,* David S. Cecelski traces the evolution of maritime slave culture from the black pirates and African boatmen of the 18th century to the slave pilots in North Carolina ports.



Cecelski, whose "Historian's Coast" essays have appeared in *Coastwatch,* sheds light on often overlooked chapters of history. He tells of the black watermen who piloted Union vessels and the slave pilots who helped runaway slaves escape by ship.

"The stories of slave watermen's lives usually have to be teased from the barest threads in the documentary record," Cecelski writes. Through steadfast research of slave narratives, he provides insight into the lives of the many African Americans who worked as boatmen, pilots, fishers, sailors, stevedores and shipwrights.

His stories capture their struggles along the way to freedom — from the colonial era through Reconstruction, from the Great Dismal to the Cape Fear, and from bustling seaports to quiet fish camps.

Cecelski is the Lehman Brady Joint Chair Professor in Documentary and American Studies at Duke University and the University of North Carolina at Chapel Hill. He is the author of several other books, including *Along Freedom Road: Hyde County. The Waterman's Song* is available from The University of North Carolina Press. — P.S.

Wetlands Project to be Community Model

Airlie Gardens, a popular New Hanover County park, recently began construction of a one-acre rain garden. The man-made wetland project could become a model for alternative methods of catching and treating stormwater.

Stormwater from a nearby housing development will filter through the rain garden before running into Bradley Creek — one of many creeks and streams that drains into the environmentally sensitive Cape Fear River.

Airlie Gardens officials hope both developers and planning officials will consider constructed wetlands as an effective stormwater management technique.

Students from Cape Fear Community College will help Airlie staff members install and maintain the new rain garden.

Airlie Gardens, known for its display of azaleas, is a favorite destination for Wilmington residents and tourists. In 1998, New Hanover County purchased the gardens from a private landowner, in part, with a grant from the N.C. Clean Water Management Trust Fund. — P.S.

Coastal Ocean Program Receives NOAA Grant

The University of North Carolina at Wilmington will continue its Coastal Ocean Research and Monitoring Program with a $925,000 grant from the National Oceanic and Atmospheric Administration (NOAA).

The interdisciplinary program provides in-depth research of the biological, chemical, geological and physical/meteorological dynamics of North Carolina's coastal ocean. Broad initiatives within the program include fisheries, oceanography, coastal ocean water quality, coastal ocean productivity, sediment transport, shoreline stability, ocean circulation and weather, and the general health of the coastal ecosystem.

"We have begun a far-reaching program to assure that future decisions regarding the health of our fragile coasts is based on comprehensive information and understanding," says Marvin K. Moss, professor of physics and physical oceanography and program director.

The program is designed to address the rapid growth and development of the Southeastern region and its effects on the coastal system, as well as the long-term problems associated with frequent hurricanes and other storm systems, beach erosion, polluted run-off from cities and farms, and loss of living resources.

Data will be collected from 17 permanent moorings in the coastal waters of North Carolina's Onslow and Long bays, as well as 20 or more fixed sites.

More than a dozen researchers are involved, from UNC-W, North Carolina State University, the University of Rhode Island and NOAA's National Undersea Research Center. — K.M.

Beauty in the Eye of the Beholder:

Hammocks Beach State Park

BY PAM SMITH

PROLOGUE

There are many stories to tell, and many ways to tell them. A story about a person, for example, is straightforward, sometimes biographical. A story about an event must be factual, perhaps based on historic evidence.

The story of a place — especially if that place is Hammocks Beach State Park — is often much more subjective. Its telling is colored by the perspective and experience of each storyteller.

Some elements, of course, are universal. Hammocks Beach State Park is located near Swansboro in Onslow County. The park's 33-acre, well-appointed mainland site is a boat ride away from the main attraction — Bear Island, an 892-acre, undeveloped barrier island. The biodiversity of the newly acquired Huggins Island is well-documented. The 110-acre island of uplands, swamp and inland marshes could become an education and research jewel.

Common, one-word descriptors for the park complex might include "remote," "tranquil" or even "primitive."

CHAPTER ONE: The Vision

Park Superintendent Sam Bland's story of Hammocks Beach is best told from atop a high dune on Bear Island. A picture-perfect sunrise illuminates the park's watery boundaries and diverse environmental assets.

The complex is embraced by Queens Creek, the White Oak River, the Intracoastal Waterway, the great Atlantic Ocean — and restless inlets, acres of pristine tidal marsh and estuarine waters, and miles of oceanfront beaches.

The purchase of nearby Huggins Island in 1999 bought protection for the environmental integrity of Hammocks Beach State Park, Bland explains. The lack of development eliminates the threat of leaching septic systems or stormwater runoff from hardened surfaces — effects that could degrade surrounding waters and the diverse ecology of the island itself.

Partnerships were the key to the island's acquisition and inclusion into the park system. Funding came from the N.C. Clean Water Management Trust Fund, the N.C. Natural Heritage Trust Fund and the N.C. Division of Parks and Recreation. Additional support was from the National Oceanic and Atmospheric Administration, the N.C. Wetland Restoration Program and the North Carolina Coastal Federation.

The view across the marsh toward the mainland visitors' center, ferry dock and boat launch areas provides a glimpse of the park's recent history as well as Bland's vision. When Bland was transferred to the park some 15 years ago, the mainland area was little more than a one-acre jumping-off place for the ferry and private boats heading for Bear Island. Since then, the state's acquisition of additional acres provided the catalyst for needed facilities expansion.

The recent completion of a handsome visitors' center is one step toward making Hammocks Beach State Park a year-round destination for people interested in learning about the coastal environment, Bland says. Soon-to-be-installed exhibits will reflect the natural features of the coastal area from the marsh to the beach — and all the ecological zones of Bear Island and Huggins Island.

Park rangers have participated in the federal loggerhead sea turtle protection program since 1975. They began tagging nesting turtles a decade ago. "Many turtles return to Bear Island beaches over and over to lay their eggs," Bland says.

The island also is ideal for the study of colonial nesting birds. In addition, the state's Natural Heritage Program conducted a baseline survey of flora and a cultural history

Continued

Ken Taylor

Doug Smith

Ranger Kevin Bleck never tires of the natural beauty of Hammocks Beach State Park. Behind him is a restored wetland that leads to the new visitors' center.

of park properties. Park staff members add to the "inventory" with newly discovered natural treasures.

A mini-theater will feature videos of the nesting sea turtles, coastal birds, Bear Island's remarkable dune system — and the night sky that captivates campers.

"These are things that people come to see and enjoy. The message will be one that advocates conservancy and stewardship on both a local and global scale," Bland says.

"Visitorship is huge
But ours are not your average tourists.
Our visitors are environmental
advocates who appreciate primitive
camping and the rare qualities of an
undeveloped barrier island."
— Sam Bland, park superintendent

"Visitorship is huge," Bland says, "But ours are not your average tourists. Our visitors are environmental advocates who appreciate primitive camping and the rare qualities of an undeveloped barrier island."

In contrast, just across Bogue Inlet, lies Emerald Isle — a barrier island with side-by-side houses, condos and commercial properties from ocean dunes to the edge of the sound.

Thanks to the protected status of the complex, that will never be a scenario in Bland's park story.

CHAPTER TWO: The Partners

Todd Miller, executive director of the North Carolina Coastal Federation, is likely to begin his story with a bit of history.

In the 1920s a wealthy New York surgeon owned the island and a 4,600-acre mainland site known as "the hammocks." He intended to will Bear Island to the family of his long-time hunting and fishing guide, John Hurst. But Hurst suggested that he donate it to the North Carolina Teachers Association, an organization of African-American teachers.

The island was under the association's management for more than a decade. In 1961, the association donated the undeveloped island to still-segregated North Carolina for a park for minorities. It opened as Hammocks Beach State Park for all citizens following the passage of the Civil Rights Act of 1964.

Miller's story also is flavored by his memories of growing up in Ocean, a nearby community. Here is a setting that lends itself to idyllic summer days exploring a maritime forest, spotting blue crabs in a tidal marsh, and jumping waves on a perfect beach.

Hammocks Beach State Park remains a stellar facility, he says. "Its management is a model of stewardship."

That's a high compliment from Miller, whose love for coastal North Carolina is both a vocation and an avocation. He founded the Coastal Federation in 1982 as a rallying point for people who feel deeply about the coast and want to help preserve priceless ecosystems.

"Our role is to prod the political system and keep things moving," Miller says.

It's also one of action. Not surprisingly, Miller and the federation are staunch park supporters and partners. Along with helping with the Huggins Island purchase, his organization helped to plan the expansion of the mainland areas. The imperative was to maintain or improve water quality.

Talk about timing. Park officials were ready to remove an old bulkhead at the original mainland ferry dock. Tracy Skrabal, federation senior scientist, was looking for a laboratory for estuarine shoreline erosion control.

"It was an opportunity to do things differently," says Skrabal. The first phase was to remove the bulkhead and replace it with natural vegetation to filter and absorb runoff from the impervious parking lot.

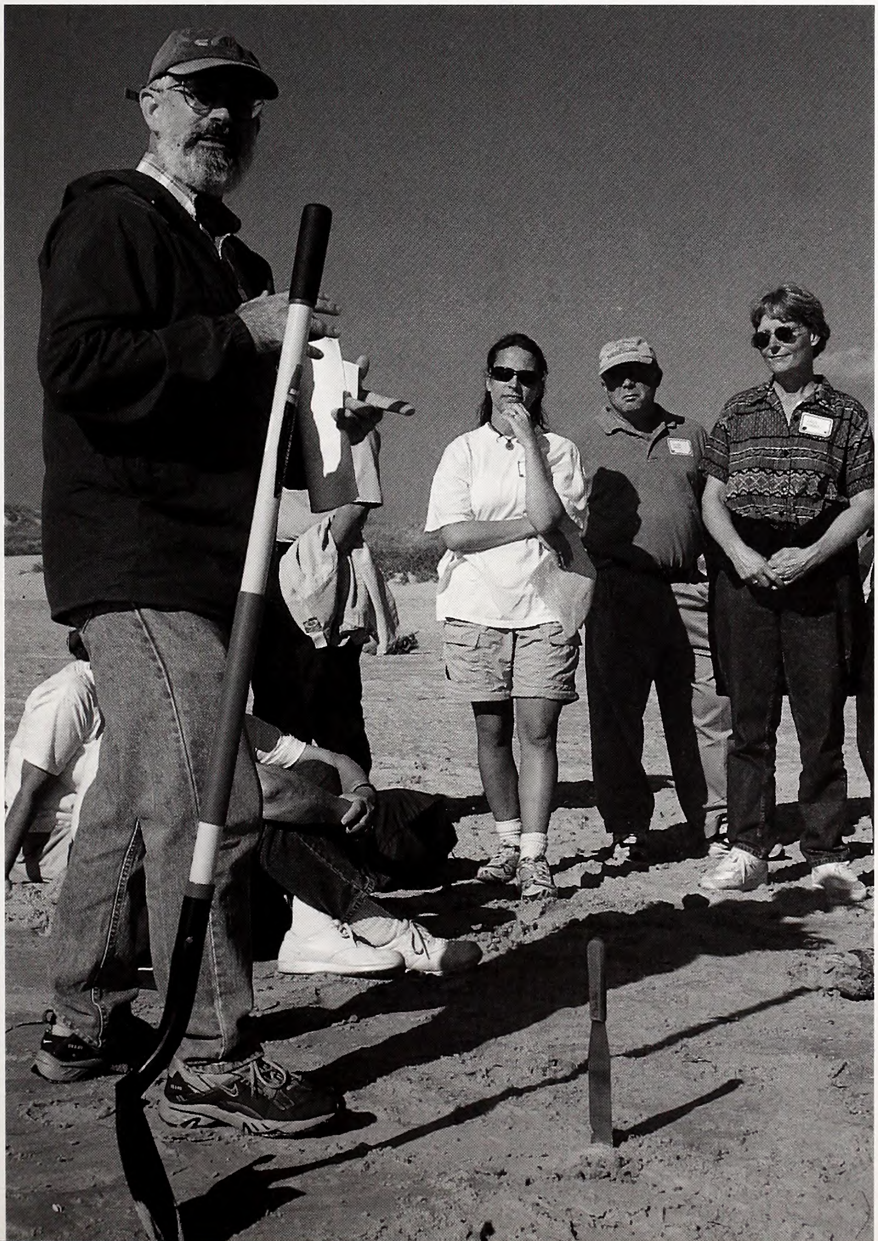
Skrabal says the creation or restoration of natural marshes is a cost-effective way to buffer boat wakes, reduce pollutants entering the water, enhance fisheries and near-shore habitat, and improve the aesthetic view from land and water.

Skrabal says the efforts address immediate water quality concerns and the possibility of chemicals leaching from treated wood. The plan also eliminates costly repairs to aging wooden bulkheads.

In addition, Skrabal designed a constructed wetland to meet stormwater management needs at the new visitors' center and ferry dock.

The Coastal Federation also is leading an effort to have the White Oak River designated as a "Recreation and Scenic River" by the federal government. This will provide additional protection for the pristine waters just behind Bear Island.

John Wells, director of the UNC-CH Institute of Marine Sciences, uses common tools to tell the story of the barrier island's geological history.



Pam Smith

To strengthen the cause, the federation joined forces with the U.S. Forest Service and local citizen groups, the Carteret Canoe and Kayak Club and Crossroads.

"In North Carolina, so many people are directly affected by so many aspects of the coast. Those are the people who can energize an issue to get something done — or at least can get the ball rolling to raise awareness to what is important," Miller says.

"One person starts the ball rolling, and others add shoulder or clout — whatever it takes to maintain the momentum."

CHAPTER THREE: The Experience

Soon, new voices will be telling their own stories based on experiences at the Coastal Federation Summit held at Hammocks Beach State Park. The summit is a time to reflect on accomplishments and to become energized to meet the challenges ahead.

The entire park is a classroom, where conference participants become students and spread out for crash courses in coastal processes, history and culture. Their newly discovered "facts of life" will be incorporated in their telling — or will frame a deeper understanding of future news articles or political debate about coastal issues.

Bland Simpson, author of *Into the Sound Country*, spins modern folklore in the context of the coastal history and culture. He tells of people whose roots sink deep in sand, streams and salty marsh; of watermen who know where fish are running; and of isolated coastal communities where people may be poor, but not in need.

And, on the sandy beach of Bear Island, Richard Spruill, an East Carolina University hydrology professor, provides insight into a hidden resource on this unspoiled island — fresh water. He explains the water cycle, relationships between groundwater and

Continued

Scott D. Taylor

An estuarine shoreline restoration project by N.C. Coastal Federation reduces pollution runoff, buffers boat wakes and enhances the view.

surface waters, stormwater runoff and the water supply.

The bottom line? The freshwater aquifers that provide drinking water to coastal communities are under great pressure from the population boom of the past decade. There is not an infinite supply of fresh water.

Nor is there an infinite amount of sand in the coastal beach system, says John Wells, professor of geology at the University of North Carolina at Chapel Hill. The beach is his blackboard, a spatula his chalk as he illustrates long-shore transport of sand.

Wells believes there are three truths of science. Nothing is black or white. Science is not isolated, but rather integrated with economics and politics. Science evolves.

Some members climb into canoes and kayaks to quietly paddle through creeks, marshes and sounds surrounding Bear Island. They may catch a glimpse of osprey and skimmers, cormorants, great blue herons and laughing gulls. If they're lucky, they may see a playful otter or curious dolphin. They'll also learn how marsh grass filters pollutants.

Ranger Kevin Bleck maneuvers the ferry as close to the Huggins Island shore as he dares at low tide. He wants to offer passengers the best view of the park's new jewel. He tells them the state has given an Outstanding Resource Waters designation to much of the surrounding waters.

The island holds clues to its place in coastal history from Native American artifacts to an earthen Civil War fort to remnants of a peach orchard.

> "It opens up the coast for a lot of people. It's hard to measure its educational value, but I met a lady from Ohio who never saw a blue crab until today. Today made a difference for her."
>
> — *Harry Wigmire, volunteer*

Park officials are studying how to provide access to the island for education and research while protecting its ecological qualities — including a rare freshwater swamp.

Bleck, a native of Maine, says he was drawn to Hammocks Beach State Park by its natural beauty. Each day is a new story. "It may be a dramatic view of a nesting pair of eagles on one of the islands in the marsh. Or the dolphins — every time I see them, it's special," he tells the passengers.

As far as coastal federation volunteer Harry Wigmire is concerned, the day in the park is a huge success. "It opens up the coast for a lot of people. It's hard to measure its educational value, but I met a lady from Ohio who never saw a blue crab until today. Today made a difference for her."

They all will have stories to tell, he says.

DÉNOUEMENT

Sunset may lure Superintendent Bland back to Bear Island to conclude his well-told tale. The magenta sky reflects across the marsh.

"I want to let people know and understand that the marsh is more than an aesthetic view. It's a productive ecosystem. It's a nursery for most commercial and recreational fish North Carolina anglers enjoy."

But the beauty doesn't escape the superintendent. His favorite time and place?

"Sunset in the dunes on Bear Island — especially when the fading light catches the blue stem that bloom in the fall of the year."

Michael Halminski

Lifelong Lessons:

Coastal Themes Resonate

By Katie Mosher

Growing up on the Outer Banks, Marc Basnight learned a bit about weathering storms — like the time his mother, Cora Mae, explained about hurricanes.

"When Donna came, I remember Momma taking me outside and standing in the eye as it passed over and everything was calm," he says. "Now don't get me wrong, she never wanted one — but she told us why the Good Lord brought hurricanes."

The storms, his mother explained, were part of the cycle of nature. "There was a reason. It had to happen," he recalls the lesson, one of many from his youth that resonates as he serves as president pro tempore of the North Carolina Senate.

"It still affects me — how I look at things. If you live in a city of concrete, you vicariously experience the environment," he says. "When you grow up in a coastal community, you know the value of the environment — that you need to protect these lands that are part of the food chain."

Continued

Aycock Brown, courtesy of the Outer Banks History Center

Drew Wilson, courtesy of the Outer Banks History Center

That perspective shows when Basnight calls for wastewater treatment updates, requirements that may be contested by inland officials who feel the cost would be excessive. Their arguments are "short-sighted" Basnight explains, because treated water moves from a river to an estuary and eventually into the sea. "Without the sea, there is no life," he says. "Oceans don't survive without the creeks, without the estuarine systems."

Coastal ecosystems can feel the strain of the cumulative impact of the growth across the state. Basnight often is challenged to describe complex environmental changes in terms everyone can understand — crucial efforts in tight budget times.

"I have witnessed attempts to remove money for water quality projects," says Basnight, who is credited with establishing the state's Clean Water Management Trust Fund in 1996. The fund is the state's only dedicated source of funding to preserve environmentally sensitive areas to ensure water quality. Such projects, he says, are not limited to the coast. "We shouldn't have imaginary lines dividing the state," he adds.

Despite his role on natural resource issues, Basnight refuses to be labeled. "I am not an 'environmentalist.' You can't stamp me," he says. "I come with the independence of the Outer Banks."

For example, he says, the state can step too far, even on environmental matters. "There must be value in every regulation," he says, pointing out the possibility that regulations may have unexpected adverse effects on individuals or communities. "The government should be flexible," he says.

Tides of Change

When Basnight was growing up in the 1950s, the Outer Banks featured a series of quiet fishing villages with scattered cottages. Even today you can hear a bit of his "hoi toider" accent that harkens to a time when the region was isolated from the rest of North Carolina.

His grandfather, Moncie Daniels, ran a general store and chaired the Dare County commissioners. His mother drew accolades as a veteran actress in "The Lost Colony" outdoor drama. Fellow cast member Andy Griffith remains a family friend. Basnight himself had small roles as a youngster.

A 1966 graduate of Manteo High School, he went to work in his father's construction business that specialized in water and sewer lines. Now when he is not in Raleigh or on the road on state business, you can find Marc Basnight greeting customers at Basnight's Lone Cedar Café, a restaurant run by his wife, Sandy, and his older daughter, Vicki. A younger daughter, Caroline, is a student at the University of North Carolina at Chapel Hill.

On weekends, he strides from table to table, calling locals by name and asking after their families, or making sure tourists have an enjoyable meal and plan to return to the Outer Banks. Sometimes folks make the long drive just in hopes of catching a few moments of his time.

The restaurant features local seafood, and his extended family includes folks in the fishing and restaurant businesses. The café even boasts its own soft-shell crab operation out back that serves as a demonstration project. The shedding technol-

Michael Halminski

LEFT TO RIGHT:

Marc Basnight, now president pro tempore of the North Carolina Senate, is second in this line of youngsters auditioning for a role in The Lost Colony *outdoor drama.*

In this 1988 photo, Rich Novak, left, then a specialist with North Carolina Sea Grant, assesses the items collected by Marc Basnight, right, during Beach Sweep in Dare County.

Taking time to chat with constituents, Marc Basnight, center, meets with folks during a recent event on the coast.

ogy was introduced to the Outer Banks by North Carolina Sea Grant fisheries specialist Wayne Wescott, who grew up in Manteo with Basnight.

Basnight knew early on that the coastal communities had a direct link to the universities — his father-in-law, Hughes Tillett, was the first Sea Grant extension agent in North Carolina.

Basnight never earned a college degree, but his legislative focus on education earned him an honorary doctorate of law from the University of North Carolina at Chapel Hill and a leadership award from the North Carolina State University Alumni Association.

Many in Dare County will recall that Basnight was a leader in planning for local celebrations for the nation's bicentennial in 1976. A year later, he was named to the N.C. Board of Transportation. While he disputes stories that he wore sandals to his first board meeting, he was not a suit-and-tie kind of guy at the time.

When a cousin, Melvin Daniels, stepped down from his state Senate seat, Basnight was tapped to run. In his first attempt at public office in 1984, he won the seat representing eight northeastern counties and portions of three others — an area compared to the size of the state of Connecticut. While Dare County has seen economic growth through tourism, several counties in the northeast have struggled to maintain their population and to seek out new business or industry.

As chairman of the Senate Appropriations Committee in the early 1990s, Basnight faced a $1 billion shortfall in the state budget. His leadership through those difficult times was rewarded when he was elected president pro tempore in 1993 — and he holds the distinction of being North Carolina's longest-serving legislative leader in either chamber.

Visions of Leadership

Basnight insists that he is one part of a pool of decision-makers in state government. "I never get up in the morning and feel I know more than my neighbor — and that neighbor may be anyone in the state of North Carolina," he says.

Profiles last year in Raleigh's *News & Observer* and *Metro Magazine* describe Basnight as a study in contrast — a shrewd politician, yet also a down-home friend to many. He regularly stops by country stores to chat, but he also can help focus political fundraising for specific races.

"Basnight gets results, in part, because he is a consensus builder, carefully cultivating Democratic caucus members and soliciting their views and sharing power," the N&O story says.

But consensus is not always achieved. Basnight acknowledges there are times where he must sort through arguments where each side offers valid points. "Every politician has difficult decisions to make. And there is someone out there — sometimes a long-time friend — who disagrees," he says.

"I have to make tough calls — and the call often becomes final from where I am at," he says. "That can be an uncomfortable position."

He also must weigh the various requests or suggestions that

Continued

Michael Halminski

LEFT TO RIGHT:

Few folks still use mechanical gear to harvest oysters commercially in Dare County.

Culling marketable "crab slough" oysters from the harvest can be a tedious task in winter months.

In the early 1900s, North Carolina was famed for its oyster harvests. Now 90 percent of oysters sold or shucked in North Carolina are from the Gulf of Mexico.

come to his office. "Sometimes folks call and say, 'Marc, you know you could do something.' And I probably could, but that would change the way I govern."

The disagreements in the legislature are like those in a family, he says. Some blow over in a week. Others could lead to a divorce. "In our process, in our republic, our democracy, you have to do what you truly believe is right," he says.

Sometimes that means a change in position. "If I flip-flop, so be it," he says, adding that he refuses to sign pledges that have become popular in some political circles.

"I want the freedom to make the right choice," he adds, noting that new facts may come to light during the course of a debate. "I want to remain where I can change my mind," he says.

Innovative Partnerships

Among his coastal efforts over the years, Basnight takes particular pride in the N.C. Fishery Resource Grant Program (FRG), the first state program to provide research funds for projects developed by individuals in the fishing and seafood industries. He cites a positive impact along the North Carolina coast, where the residents use intuition and experience to propose projects to define what is happening in the waters they know so well.

North Carolina Sea Grant administers the $1 million-per-year FRG program that encourages partnerships between the fishing communities and university researchers. Those partnerships are important, for they recognize the knowledge of people who have worked the waters for generations, Basnight says.

"We can't succeed in our future without understanding our past," he adds. "If there is one significant finding, it all would be worth it."

The program has funded a wide variety of projects since it was founded in 1994. Project results have been considered during discussions of fishery management options — including several of the species-specific fishery management plans. FRG researchers often are asked to share their findings with the N.C. Marine Fisheries Commission. An FRG report on small-mesh gill nets in Currituck Sound was presented in December 2001, as the commission was considering the striped bass management plan.

National Fisherman featured a cover story on Pamlico County students who have tested bycatch reduction devices in FRG-funded projects. Currently, 11 crabbers and a graduate student are working together to reduce mortality in the soft-shell or peeler crab industry. And processors are working on formulas for value-added seafood products that consumers and chefs can prepare with ease.

FRG was the model for a grassroots fishery research program in Virginia, and other states are considering similar programs. "We have been able to demonstrate that when fishing communities work with scientists, we get the best from both worlds," says Ronald G. Hodson, North Carolina Sea Grant director.

In 2000, Basnight spearheaded the establishment of the state's Blue Crab Research Program. Administered by Sea Grant, the program focuses $500,000 each year on researching the

Michael Halminski

Michael Halminski

state's leading commercial fishery. And again, there is an emphasis on teaming crabbers with academics.

Even in tight financial times, Basnight sees a need to learn more about the blue crab fishery in North Carolina, especially as Chesapeake Bay stocks have declined markedly. "How do you find out unless you do the research?" Basnight asks.

And when it comes to fishery research, Basnight sees additional needs.

Encouraging Oysters

"We've got to do something on oysters," Basnight says. "The biggest dream I have is to put oysters back into the estuaries of North Carolina — like they were before."

In the early 1900s, North Carolina was known for its oyster harvests. Now, more than 90 percent of the oysters sold or shucked here come from the Gulf of Mexico, according to the N.C. Shellfish Sanitation Section.

For communities that still have oyster festivals, that means most of the oysters served are not local. Many areas of coastal waters are closed to shellfish harvesting because of pollution.

Initial steps could include creating new oyster reefs with wetland mitigation funding from state transportation projects in the coastal area, Basnight suggests. Or efforts may be funded with federal grants, such as an oyster reef project at Nags Head Woods.

The value of oyster reef restoration is three-fold, Basnight explains. Oysters filter water, thus enhancing water quality in the vicinity of the new reefs. The reefs also provide habitat areas for important commercial and recreational fish species. And eventually, the oysters may become stew, fritters or a steamed delicacy.

"Imagine what we could do," he says, looking out a window in his restaurant, across the Roanoke Sound to Shallowbag Bay and the town of Manteo. "When I grew up, you'd catch all you could. Now there aren't any in that bay that I grew up on — and I am only 54 years old."

Oysters are not a new topic for Basnight, who was a force behind the formation of the N.C. Blue Ribbon Advisory Council on Oysters. The 19-member council — which included commercial harvesters, mariculturists, biologists, market specialists, processors, fishery scientists and social scientists — offered a report in October 1995.

The council's major recommendations included efforts to encourage mariculture by revising some laws and procedures, as well as efforts to restore or protect existing reefs. Other efforts would be to protect water quality, to provide environments where oysters could be harvested for consumption, and to support an industry-based seafood council to increase consumer demand for oysters and other seafood.

Basnight's vision includes communities being able to market oysters in terms of distinct flavors and products. "We must reverse the decline," he says of the current status of oyster stocks.

"We are going to have to accelerate these efforts," Basnight says. "We are not doing nearly enough." ▣

POUND NETTING:

Rich Fishing Tradition Seeing Decline

By Ann Green

As Mike Peele guides his old shad boat through the middle of the Pamlico Sound, the water is so smooth he sets the automatic pilot.

Standing toward one side of the boat, Peele spots a group of white poles and moves back to the steering station to slow the engine. With one hand on his knee and the other on the steering wheel, he maneuvers the boat into the middle of a huge maze of fishing net.

"I just put on a new propeller," says Peele. "The engine is like a sailboat — slow and easy. I will be working two nets. If the wind's blowing 30 mph, you can put 10,000 pounds of fish in the gunwale."

After anchoring almost four miles behind Hatteras Island, Peele slips a pair of rubber gloves on his hands and green overalls over his tank-style T-shirt and shorts. Immediately, he and his fishing partner, Jeff Kennedy, tie the net to the side of the boat and pull it in so tight that the area is closed off.

"This is called bunting or pursing up — forcing the fish on one side," says Peele. "Pound netting is the safest way to fish. You get all live catch and can sort through what you don't want."

To recover the catch from the pound net, both fishers use dip nets. Peele pulls up a few wiggly fish, including a pompano, butterfish and a five-pound flounder.

"This is a pretty one," he says while holding up the flounder. "The biggest flounder I ever caught was 10 pounds."

A muscular, middle-aged man with several tattoos on his arms, Peele is the fifth generation of his family to set pound nets for flounder each fall in the Pamlico Sound.

"I was probably 10 when I started doing pound nets with my father and Uncle Nacie Peele," he says.

After Mike's dad died, Nacie continued to fish. On a recent day, the colorful 82-year-old had caught about nine pounds of flounder.

"I have been fishing for 68 years," says Nacie. "I fish every day. The best fishing is with a pound net."

Nacie collected his first paycheck for fishing when he was 13.

"For my first paycheck, I pulled in 5,000 pounds of flounder and got half of the price — or $13," he says.

Fellowship Among Fishers

There is camaraderie among Hatteras Island fishers. Young guys help old-timers when they need a hand and vice versa. They even borrow each other's boats when one has a broken part.

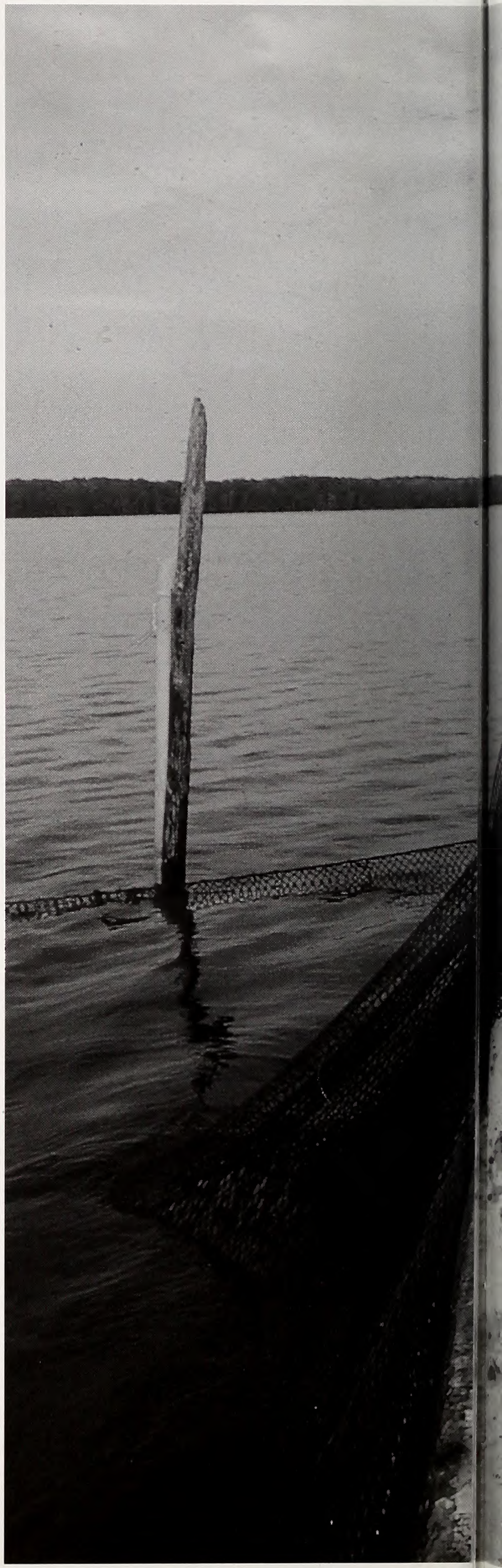
While in the middle of Pamlico Sound, Mike Peele stops and chats with Wayne Basnett who is checking his net. Basnett has been fishing for flounder since 1957.

"I will come and help you," says Peele. "You need to raise up the pound."

For the Peeles and other fishers on Hatteras Island, flounder season starts in early September when they set their nets in permitted spots in the sound.

"There is a lot of work involved in setting nets," says Mike Peele. "You have to go in the woods and cut the wood for the poles and then tote it out. Now you have modern technology to take the wood down. But you used to have to cut

Continued



RIGHT: Herbert Byrum checks another herring catch on the Chowan River.

Scott D. Taylor

Michael Halminski

Veteran fisher Mike Peele pulls up some flounder in the Pamlico Sound.

trees down. You can envision how much work it was in the old days."

Fishers also have to dip nets in a copper solution to reduce the growth of marine organisms, including barnacles. They spread the heavy nets out to dip them and then lift them up with a large crane rigged on the back of a "boom" truck or old pickup truck.

At Cedar Island in Carteret County, they celebrate the hard work of fishers with a boom truck parade in the winter.

"They have between 15 to 18 trucks," says Joey Gilgo of Atlantic, whose truck is in the parade. "Trucks are painted up every imaginable way — from nets hanging from the booms to clam cages painted on."

Passive Gear

Although the pound net is tedious to set up, it is an efficient way to catch fish, according to Jim Bahen, North Carolina Sea Grant fisheries specialist. "Pound netting is considered passive gear because fish are led into it. All fish are caught alive. You can throw back what you don't want."

In North Carolina, the North Carolina Division of Marine Fisheries (DMF) requires a 5 1/2-inch mesh escape panel in all flounder pound nets except those in the western Albemarle Sound, allowing flounder 12 inches long and less to get out.

Pound nets also do little harm to the turtle population, fisheries officials say.

In random sampling of pound netters in Pamlico Sound as far north as Avon and south to Core Sound and Back Sound behind Harkers Island, the National Marine Fisheries Service (NMFS) found that the fishers caught more than 250 turtles alive during fall 2001.

"There is little turtle mortality associated with pound nets because the turtles can come to the surface to breathe and rarely become entangled in the nets," says Joanne McNeill, NMFS fishery biologist in Beaufort. "In the fall as turtles migrate out of the sound, they are incidentally captured in pound nets. Also, some loggerheads enter the pound nets looking for a source of food."

However, pound nets have one drawback — the maze of poles can be a navigational hazard for boaters who aren't aware of them, according to North Carolina Sea Grant fisheries specialist Bob Hines.

In North Carolina, pound nets are used to catch flounder in Currituck, Albemarle and Core sounds and also in the Pamlico Sound — from Hatteras Island to Hyde County and south to Carteret County. Fishers also use this traditional gear for summer flounder, gray trout and Spanish mackerel in the Pamlico Sound, as well as for river herring in the Chowan River and Albemarle Sound.

Over the past five years, the number of North Carolina permits for pound nets has dropped significantly across North Carolina from 965 in 1995 to 634 in 2001, according to the DMF.

"During the 1990s, fishermen began to switch from pound nets to gill nets," says David Taylor, DMF fisheries section chief. "Gill nets are easier and cheaper than pound nets and don't require permits."

Taylor also attributes a decline in permits to the consolidation of nets and fewer "block nets."

"Fishermen used to put up block nets around other nets so the migration of fish wouldn't be obstructed," he adds. "They have gotten rid of some of the block nets."

River Herring Fisheries

One of the biggest declines in pound net permits has been in Chowan County where the number of nets dropped from 122 in 1995 to 67 in 2001, according to DMF.

"The number of nets has dropped because of harvest quotas on herring that was put in effect in 1995," says Sara Winslow, DMF northern district manager.

Prior to 1995, there were no restrictions on river herring. However, quotas were set in 1995 to let the stock rebound because of overfishing and adverse environmental conditions as well as pollution and runoff to ditching. Also, the draining of the Chowan River's tributaries for agriculture destroyed some herring spawning grounds.

In 2000, the N.C. Marine Fisheries Commission adopted a Fishery Management Plan for river herring to protect herring stock. The plan limits the commercial herring fishery to 300,000 pounds per year for the entire state. That total allowable catch is divided into three portions: 200,000 pounds for the pound net fishery on the Chowan; 67,000 for gill nets in the Albemarle Sound herring management area; and 33,000 pounds that the DMF director can assign.

Winslow says it will be a number of years before the herring fisheries recovers. "It will take three to five years for the fish produced in 2000 to reach sexual maturity," she says.

The number of pound nets in Carteret

County also dropped, from 309 in 1995 to 166 last year.

The only area where pound net permits have not dropped significantly is along the Outer Banks. In Dare County, the number of permits declined slightly from 118 in 1995 to 100 last year.

"There are probably 15 to 20 pound netters left on Hatteras Island," says Mike Peele. "When my father and I did pound netting, there were probably 30 or more."

In Carteret County, there are a number of pound netters who fish the Pamlico and Core sounds.

For more than 25 years, Gilgo has set his nets in Pamlico Sound.

"Pound netting has been good this year except the price is the lowest in 15 years," according to Gilgo, in an interview last fall. "I caught 3,000 pounds in one day."

But, he does not plan to set pound nets in fall 2002.

"I set five nets this year," he says. "I am getting out of it. I am 57. It takes a toll on your back. You have to go out in rough weather. It takes a special breed of person to pound net because it is so strenuous."

Old Fisheries

Pound netting has a strong heritage in North Carolina. In 1869, pound nets were introduced into the Albemarle Sound and revolutionized fishing, according to the N.C. Maritime Museum. One account tells of an individual who pulled in one million herring in a single night in 1890 using a pound net.

In February or early March, fishers set pound nets for river herring in the Albemarle Sound and Chowan River.

Herbert Byrum and his brother, Bobby, are the only river herring fishers left at Cannon's Ferry on the Chowan River in Tyner.

"There used to be 20-something fishermen at Cannon's Ferry," says Herbert Byrum.

Byrum's fish house, which has an American flag flying in the front, is on the banks of the Chowan River.

As you walk down the pier, you can smell cheese used for catfish bait and shrimp used for crab bait.

"We went from making $40,000 a year for herring to $10,000 a year," says Byrum. "Now, we crab and catfish to make up the difference."

Michael Halminski

Hatteras Island fisher Wayne Basnett has been pound netting since the 1950s.

On his dock, Byrum shows his 20-foot boat used for catching herring. When it's full from gunwale to gunwale, it holds up to about 4,000 pounds of river herring. The striped bass go back over the side.

"In the heyday in the '60s, '70s and '80s, we would catch 10,000 pounds of herring a day," he says.

Now, fishers are allowed to catch only 200,000 pounds for the whole season in the Chowan River, adds Byrum.

On a recent day, Byrum, who has been pound netting since he was a high school student in the 1960s, leaves the dock and heads out into the muddy river. He stops in an area where the wooden stakes are shaped like a heart. The fish swim into the heart of the net along a lead set near the shore.

"Pound netting is beautiful fishing," says Byrum. "It gets in your blood. It is hard work and exciting. If you pull up a net with 5,000 to 10,000 pounds of fish, it is a pretty sight. On some days, we release 6,000 to 7,000 pounds of rock fish a day," he says.

Along the river, there are a few remnants of when herring fisheries dominated the area.

Some of the wooden pilings of an old fish house, which collapsed during a 1993 northeaster, lean into the water.

"That was where they processed herring," he says. "You used to pull the boat up in the middle. The fish ran up a big washer, scale and cutting bench. There would be 100 women cutting heads and guts of fish."

The decline of the herring fisheries forced Walt Jeffreys to relocate to Buxton.

"I pound netted on the Chowan River until 1985 when herring left," says Jeffreys. "Trouble came with the river flooding in '82 and '83. When I was a boy, we used to say herring ran in 30-year cycles. Had bumper crops from 1955 to 1982. We used to ship as high as 90,000 pounds of herring a day."

When Jeffreys moved to Buxton, he switched to flounder fishing. Until his brother died a few years ago, the two fished as a team. Now, Jeffreys has another worker.

"I've got six flounder rigs," he says. "I fish in water 14 to 18 feet deep."

Occasionally, Jeffrey's grown daughter, Heather Glisson, helps him.

"I like pound netting," says Glisson. "It is different." However, Glisson doesn't want to fish for a living. "It is too hard," she adds.

Jeffreys is tired of fishing, and says he wouldn't go into the business if he were starting out today. "It is like family farms," he says.

"Only big time fish places, like in Wanchese, can survive." ◘

A SON OF MANNS HARBOR:
Retired Pound Netter Shares Stories

By Katie Mosher

Manns Harbor has a rich fishing heritage. Just ask Melvin Twiddy. He loves to tell the stories of the people, the fish, the storms and the changes over time.

Twiddy, who turns 81 in late January, was only 9 years old when he arrived in the soundside community. "The people of Manns Harbor raised me," he says. By 13, he was spending some Saturdays fishing with W. F. Tillett, better known as Bugg, whose family had taken in Twiddy as one of their own.

"He built the boat that I am restoring," Twiddy says. Tillett built the shad boat about 1928. It had several owners before Twiddy bought it about 1940. "I fished it until 1995," he says, admiring the boat. "I could sit right here and look at those lines. It's a pleasure."

The design is considered a dead-rise, which differs from more rounded shadboats. "I've seen more shad on that boat than on a round-bottom," Twiddy says.

The keel features a single log — similar to canoes used by Native Americans. Twiddy has put fiberglass on the outside, and the same paint is used for luxury boats built in Wanchese.

After several years of restoration, he showed off the boat at Dare Days last summer.

Fishing Heritage

Dare County is now a tourist draw, but that was not always the case. "Manns Harbor was strictly a fishing village. There was nothing else," Twiddy says of the community once known as Croatan, but was declared Manns Harbor when the first post office arrived in 1873.

Early settlers had focused on agriculture, but fishing later took hold. "When they got the railroad line to Elizabeth City, they could ship fish north," Twiddy says.

Northern buyers would work through "fish drummers," mostly local men who would drum up business in various communities and handle shipments. Wanting to ensure regular suppliers from year to year, buyers sometimes offered advances of $100 on the next season's catch.

In the 1920s and 1930s, a successful season would clear $300 for a fishing family. "They could have seven or eight kids — and send one or two to teacher-training school," Twiddy says.

Katie Mosher

Melvin Twiddy restored this shad boat built in 1928.

The fishing community had an honor system for setting pound nets. "They respected each other," Twiddy says. "They'd set 800 yards, one to the other. They got within 150 yards of each other."

Families from Stumpy Point fished the northern waters, while Manns Harbor folks covered the south. "Whether it was a good season or a bad season, they fished the same place spring and fall," Twiddy says.

"Back then, shad was more popular than the flounder," says Margaret Twiddy, Melvin's wife of 62 years. "The people who loved shad roe are dead," she adds. But shad is still the favorite fish in the Twiddy household.

And one shad story is a favorite of friends, who marvel that Melvin Twiddy would go 1,200 miles one-way just to learn more about a single fish he caught.

Back in the 1980s, Twiddy caught a shad that had been tagged in Nova Scotia more than 400 days earlier. The next year, he went to the Atlantic province to ask some questions — and to tell them of his treasured waters.

"We missed the tagging team by 30 minutes," he recalls. But he saw the large tracking map, with tacks showing the travels of various shad from Nova Scotia to Florida.

Of Wind and Carp

Weather is always a factor in fishing. "When the water temperature is below 58, it's too cold for a trot line for crabbing," Twiddy says. "I knew when it got too cold," he says. "It would stop — like cutting off a spigot."

And he learned from veteran pound netters that a hard freeze spells trouble for flounder. "If there is a hard freeze, it takes two or three years for them to come back," he says.

The hurricane of Sept. 14, 1944 — before storms were given names — stands out. "This storm blew about the hardest of any storm — about 150 miles per hour." After that storm, the catch was light.

Hurricane Hazel in 1954 did more damage. "We had 12 pound nets flattened. It ruined the season," Twiddy says. "Up to that point it had been a good season — ahead of 1953. And 1953 had been the best year I ever had 'til then."

Sometimes, though, the change in catch had no identifiable match to the weather. Like the years that carp was king. About 1940 or 1941, a man with a strong Northern accent arrived on the ferry. "He said, 'How about selling some carp,' " Twiddy recalls.

The man, who came to be known as Sammy Carp, wanted live fish to sell in the Jewish markets in Philadelphia and New York. Now, not much carp was being caught that spring — nor was there a local demand. But Sammy was even paying the men to build boxes from lumber sent from nearby Buffalo City.

"We started building carp boxes," Twiddy says. "Then we couldn't fill the boxes fast enough. We started catching carp."

Soon the word got out, and demand went up. "That ran the price up to $3 a tub," Twiddy says. And the carp kept coming. "We got three boat loads from one pound net," Twiddy says.

After about four or five years, the northern markets found new sources of carp. "It's strange," Twiddy says, still marveling at how the supply disappeared as quickly as the demand. "It would have been a headache to fill your nets with them and not sell them." ◘

Shucking Oysters, Clams Like a Pro

By Ann Green • Photographs by Scott D. Taylor

During the winter months, oysters taste their finest. However, it requires a little work to shuck them.

At the annual Seafood Quality and Safety Workshop for environmental health specialists at Pine Knoll Shores, Wayne Mobley demonstrated how to shuck oysters and clams like a pro. The workshop was co-sponsored by Sea Grant, the UNC-CH School of Public Health, the N.C. State Seafood Lab and the N.C. Shellfish Sanitation Section.

It requires a little work to shuck oysters.

Mobley, a state environmental health specialist, says the most difficult oysters to shuck are the intertidal oysters, also called "clusters" or "coon oysters" by natives. These long, narrow oysters have a brittle shell and sharp lip.

Oysters come in two sizes — "select" or large, and standard. Before shucking any oysters, scrub them thoroughly with a stiff brush under cold, running water. Then get a sharp knife. Mobley says it is important to hold the knife properly — with your thumb close to the tip of the knife.

"This will prevent the knife from sticking in your hand if the shell breaks," says Mobley. "Place the tip of the knife in the hinge or along the lip and twist the knife to open the shell. Once you have entered the shell, continue twisting the knife and cut the abductor muscle on both shells."

Raw clams also can be difficult to open. "Just below the hinge is a 'soft, dark' spot that is easy to identify," says Mobley. "Stick the tip of the shucking knife in this location. With a lot of down force, start twisting the knife until the shell separates. Then cut the abductor muscle loose from both shells."

Both clams and oysters can be heated in the microwave for just a few seconds, shocking the animal and thus causing the abductor muscle to release the tension on the shell, according to Mobley.

"Clams also can be frozen and then thawed to facilitate the shucking process," he adds. "This works very well for making clam chowder or baked clams."

Joyce Taylor, a retired North Carolina Sea Grant consumer seafood specialist, shares these tasty ways to prepare freshly shucked oysters and clams. Taylor is compiling a book of her Sea Grant education materials and recipes.

Broiled Oysters with Fine Herbs

- 3 dozen select oysters
- 1/4 pound margarine or butter, softened
- 3/4 cup green onions, including tops, finely chopped
- 1/4 cup finely chopped parsley
- 1/4 cup finely chopped fresh tarragon
- 1/4 cup fresh cracker crumbs
- 2 teaspoons fresh lemon juice
- rock salt

Scrub oysters thoroughly with a stiff brush under cold running water. Shuck oysters. Place deep half of shells in a bed of rock salt in a baking pan. Mix together margarine, onions, parsley, tarragon, crumbs and lemon juice.

Continued

It's important to the hold the knife properly when shucking oysters and clams.

Participants in a Seafood Quality and Safety Workshop learned how to shuck oysters like pros.

Divide evenly over oysters. Broil about 4 inches from heat until done, about 5 to 8 minutes. Serves 6.

Scalloped Oysters

- 1 pint standard oysters (or selects, cut in half)
- 1/3 cup oyster liquid
- 35 fresh saltine crackers, made into coarse crumbs
- 1/4 cup finely chopped green onions
- salt
- freshly ground black pepper
- 1/3 cup heavy cream
- 1 tablespoon Worcestershire sauce
- 1/8 teaspoon Tabasco sauce
- 1/4 cup dry white wine
- 3 tablespoons margarine or butter, melted

Drain oysters well, reserving 1/3 cup oyster liquid.

Place one quarter of the crumbs in lightly greased small casserole dish. Cover with half of the oysters and half of the green onions. Lightly salt (remember that oysters are salty). Sprinkle with black pepper. Repeat. Sprinkle with the remainding of the crumbs. Drizzle with melted margarine.

Combine oyster liquid with cream, Worcestershire, Tabasco and wine and pour over the casserole. Bake at 400 F until brown and bubbly, about 25 minutes. Serves 4 to 6.

Hearty Clam Chowder

- 2 cups chopped cherrystone or littleneck clams
- 4 slices bacon, diced
- 1/3 cup thinly sliced green onions, including tops
- 5 medium peeled and diced potatoes
- 1 stalk celery, thinly sliced
- 1 medium carrot, thinly sliced
- 1 clove garlic, pressed
- 2 cups water
- 1 teaspoon salt
- 1/2 teaspoon freshly ground white pepper
- 1 teaspoon Worcestershire sauce
- 1/4 teaspoon Tabasco sauce
- 2 cups light cream

In a large, deep pan, cook bacon over medium heat, until crisp. Remove bacon and reserve. Sauté onions, potatoes, celery, carrot and garlic in remaining grease. Add water, salt, pepper, Worcestershire, and Tabasco. Bring to boil. Reduce heat, cover and simmer gently until potatoes are tender, about 15 minutes. Add clams and cook until done, about 10 minutes.

Stir in cream. Heat just until steaming. Do not boil. Top with reserved bacon. Serve immediately. Serves 6 to 8.

Baked Clams with Garlic Butter

- 36 littleneck clams
- 1/4 pound margarine, softened
- 2 tablespoons coarsely chopped garlic
- 3 tablespoons coarsely chopped green onion
- 1/2 cup coarsely chopped fresh parsley leaves
- 1/4 cup dry white wine
- 1/4 cup fresh bread crumbs
- 1/4 teaspoon salt
- 1/4 teaspoon freshly ground black pepper
- 4 tablespoons freshly grated Parmesan cheese
- rock salt

Scrub clams thoroughly with a stiff brush under cold, running water. Open clams and discard top shell.

In food processor, combine margarine, garlic, green onion, parsley, wine, crumbs, salt, pepper and half the Parmesan. Blend until smooth.

Place clams on the half shell in a bed of rock salt in a cooking pan. Spoon margarine mixture evenly over clams. Sprinkle with remaining Parmesan and bake at 500 F until clams are done and cheese is melted, about 6 to 8 minutes. Serves 6.

The hybrid striped bass is a 'potent source of antibiotics.'

Researchers Conduct Breakthrough Studies on Fish Antibiotics

By Ann Green • Photographs by Ken Taylor

As several silver and black hybrid striped bass swim around in a round tank, North Carolina Sea Grant researcher Ed Noga scoops up a tiny fish.

Although the hybrid striped bass is less than an inch long, it is a "potent source of antibiotics," according to Noga, professor at the North Carolina State University College of Veterinary Medicine.

In groundbreaking research, Noga and NC State veterinary medicine graduate student Umaporn Silphaduang discovered a new antibiotic in hybrid striped bass — which are raised on fish farms — that may have implications for treating diseases in humans and animals.

Named "piscidins" after the Latin word "pisces" or fishes, the antibiotics were isolated

Continued

from mast cells — the most common tissue immune cell found in fish and other vertebrates, including humans.

Mast cells are present in many tissues, including the skin, respiratory tract — gills or lungs — and the gastrointestinal tract.

This is the first time that researchers have isolated a peptide antibiotic from mast cells of any animal, including humans. The study appeared in a recent issue of the prestigious scientific journal *Nature*.

"The peptide antibiotics or 'piscidins' have the potential to fight important bacterial pathogens of both fish and mammals, including multi-drug-resistant bacteria," says Noga. "The antibiotics could be a useful template for designing new drugs because they are novel structures and not related to any known antibiotic. With the development of antibiotic-resistant bacteria, there is an urgent need to find new types of antibiotics that can fight these resistant pathogens."

Noga says it is unclear whether fish mast cells are from the same lineage as mammalian mast cells.

"While mast cells are one of the most common immune cells of vertebrates, their role as a critical line of defense is uncertain," he adds. "However, if any type of peptide antibiotic is also present in human mast cells, it could have important implications for treating human diseases, including asthma, skin allergies and certain types of arthritis, because of the prominent role that mast cells play in these diseases."

The study also has important implications for the U.S. aquaculture industry, which grew from $45 million for value of products sold in 1974 to more than $978 million in 1998, according to the U.S. Dept. of Agriculture.

The N.C. Dept. of Agriculture & Consumer Services reported that the state's aquaculture sales exceeded $20.5 million in 2000. Hybrid striped bass was the second highest product in the N.C. aquaculture industry, generating more than $5.3 million in 2000, according to the department.

"The new discovery can lead to ways to protect hybrid striped bass and other fish against disease without using traditional antibiotics," says Noga. "This could result in health-costs savings and a higher quality and safer product."

Umaporn Silphaduang and Ed Noga check the health status of some fish.

North Carolina Sea Grant Director Ronald G. Hodson says the cutting-edge research has tremendous potential for human medicine as well as aquaculture and other areas of veterinary medicine. "We believe this discovery is just the beginning of a whole new approach to treating bacterial diseases in humans and other animals."

What's next?

Silphaduang, who won one of NOAA's 2001 Walter B. Jones Memorial Awards in Coastal and Marine Graduate Study, says they will be determining if the mast cells of other animals, including humans, contain antibiotics.

"We hope to find an answer within the next 12 months," adds Noga.

New Stress Test

As an aquatic medicine specialist, Noga has done groundbreaking research on a variety of fish, including channel catfish, tilapia and rainbow trout.

David Robinette, a former graduate student at the NC State College of Veterinary Medicine, attributes Noga's breakthroughs in fish antibiotic studies to his creativity and attention to details.

"Ed is one of the most thorough scientists I have ever known," says Robinette, winner of a 1999 Walter B. Jones Memorial Award in Coastal and Marine Graduate Study. "He is always on top of what his research assistants are doing in the lab and helping them to develop critical thinking skills. He never leaves a stone unturned."

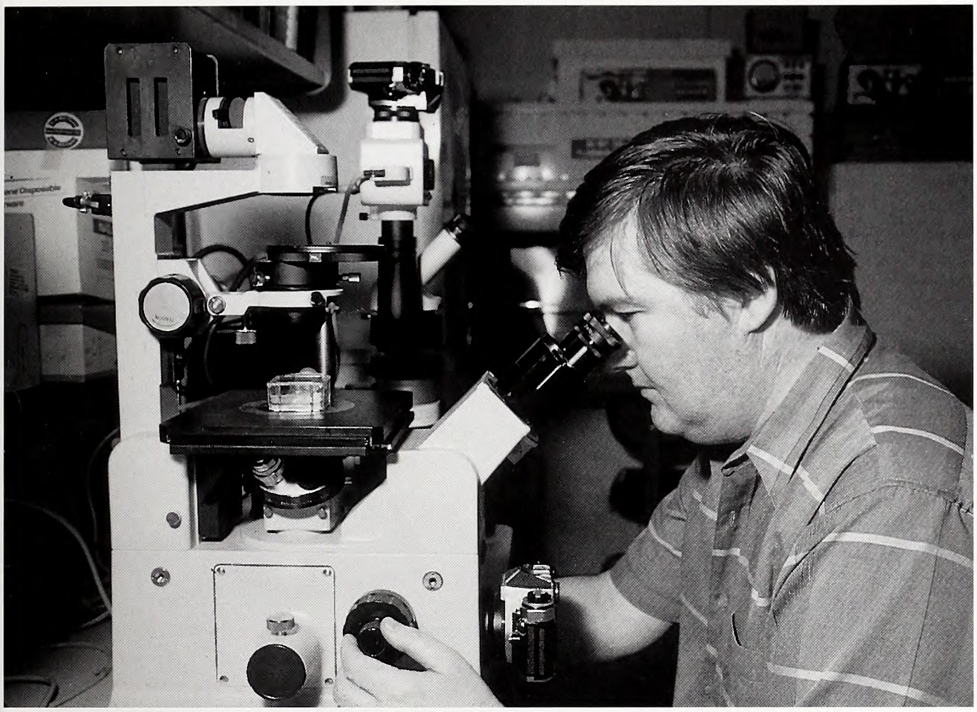
In 1987, Noga's lab was the first to develop a method for in vitro culture of the parasite *Amyloodinium ocellatum*, one of the most important pathogens affecting marine fish.

A year later, Noga and former NC State College of Veterinary Medicine graduate student Stephen Smith identified a toxic dinoflagellate later named *Pfiesteria*, which has been associated with numerous fish kills and health problems in coastal waters.

In 2000, Noga and Robinette used channel catfish to develop a new stress test for fish.

The researchers identified naturally occurring antibiotics in channel catfish that may be a promising indicator for monitoring fish health in the expanding aquaculture industry.

The scientists found that polypeptides called histone-like proteins (HLPs) are likely an important component of nonspecific immunity in channel catfish. Nonspecific immunity protects against many different diseases at once.



Ed Noga has done groundbreaking research on a variety of fish.

Specific immunity protects against a single pathogen. Thus, in some ways, nonspecific immunity can be considered a "natural broad-spectrum protectant."

"These HLPs were found in the spleen, skin, and gills and are probably in other tissues of catfish," says Noga. "So these HLPs appear to be everywhere. This is significant because it suggests that HLPs may be important in protecting against many diseases. We also found these types of antibiotics in rainbow trout and hybrid striped bass."

In the study, catfish were exposed to chronic stress — from overcrowding and elevated ammonia — for several weeks. This stress caused a significant decline in HLP levels in the skin without any visibly apparent change in the health of the fish. This indicates that HLPs could alert farmers when their fish are at risk for becoming sick, but before any visible clues are apparent.

"This suggests that monitoring HLP levels in the skin — especially during early stages of stress — can help farmers to detect problems before they become catastrophic," says Noga.

The identification of a stress test usable in the field would be important for the aquaculture industry where fish are reared under very high stocking densities, offering potential for disease outbreaks.

The channel catfish industry is the largest aquaculture sector in the United States, generating over $400 million annually, according to Noga.

In North Carolina, the total estimated value of catfish aquaculture in 2000 was nearly $3.5 million, according to the N.C. Department of Agriculture & Consumer Services.

"One of the major goals of a successful aquaculture enterprise is to avoid a disease epidemic," says Noga. "This typically involves stress reduction in fish stocks."

However, there are no practical tests available for fish farmers to use in detecting fish stress, according to Noga. "All the stress tests for fish are too expensive, labor-intensive, or not very useful in assessing health in the field," he adds. "We are hoping to develop a test for fish farmers that can done on-site in less than 30 minutes."

Hodson says this research has important implications for the marine aquaculture industry. "There are few antibiotics to treat fish," he adds. "This test might give growers a chance to detect health problems earlier — and thus avoid the need for drug intervention."

FRG Project

Through a N.C. Fishery Resource Grant (FRG), Noga is working with veteran crabber Robin Doxey of Merritt and Bill Gordon of Bethyl Labs in Texas to develop a blood test for peelers — crabs that are about to shed their shells. The FRG program is funded by the N.C. General Assembly and administered by North Carolina Sea Grant.

Noga's goal is for shedders and fishery managers to administer a simple test.

"This test is based on the same principal as the one for channel catfish," says Noga. "The blue crab has a potent antibiotic in its blood. Crabs from highly stressed environments have less of this antibiotic compared to crabs that are less stressed. Crabs with shell disease have even less of this antibiotic."

In North Carolina, blue crabs, including soft and peeler crabs, are a valuable fishery. From 1999 to 2000, the value of soft-shell crabs jumped from about $2.1 million to $3.3 million, according to the N.C. Division of Marine Fisheries.

"Mortality is a serious concern in shedding operations and has in many instances caused considerable economic losses," adds Noga.

Shedding operations use high-density, recirculating systems that can increase the risk of disease and mortality, according to Noga. Now, crabbers rely on observation and measures of water quality, including dissolved oxygen and ammonia levels, to determine the health of crabs.

"Simply observing a crab is a very inaccurate indicator of health or survivability, unless the crab is near death," says Noga. "While maintaining high dissolved oxygen and low ammonia levels is important for shedding, problems often occur when these levels are normal because you cannot measure all water quality factors that adversely affect blue crabs."

With the test, crabbers will be able to quickly and precisely determine when crabs are stressed so that corrective measures can be taken before mortality occurs.

"We hope that these types of tests will become one of the most useful tools that we have for health management of aquatic populations," Noga says. ◘

NATURALIST'S *NOTEBOOK*

NATURALIST'S
NOTEBOOK

Field Notes from Bear Island

By Pam Smith

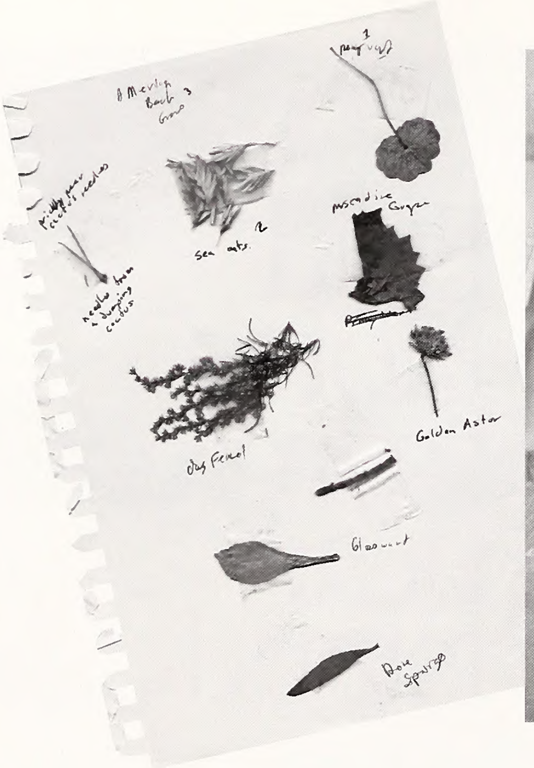
When it comes to learning about the coast, there's no substitute for experience. So it is that North Carolina State University students embark upon Bear Island at Hammocks Beach State Park for a first-hand view of the environment.

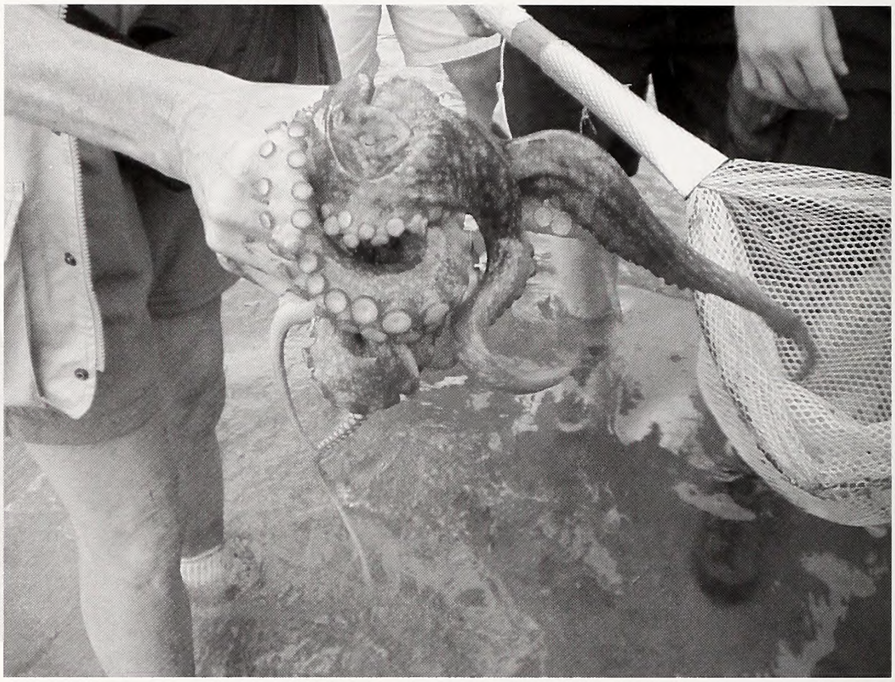
The field study is part of the semester-long Multidisciplinary Studies course, "Coastal and Ocean Frontiers," otherwise known as MDS 220. The class is taught by North Carolina Sea Grant's Lundie Spence, a marine education specialist, and Walter Clark, a coastal policy specialist. Experiencing nature is the best way to judge the value of public trust lands, barrier islands or water quality, they say.

Come along and share the students' discoveries and observations:

Continued

Bear Island has some of the most spectacular, intact dune fields on the North Carolina Coast. Photo by Ken Taylor




Nancy Cowal

KRIS CLINARD, ***a senior from Kernersville majoring in computer engineering***

I found the trip to be a very important feature that helped tie together the lectures in class. The real world experience showed the impact that nature can have on one of its own islands. I had never really witnessed first hand the erosion that occurs due to hurricanes, smaller storms and waves on an island that was not inhabited. It was very impressive to see the amount of sand that had been taken away from the shore all around the island and how it was really changing right in front of our eyes.

After marking off the amount of distance that a homebuilder would have to allow from the first line of sable and natural vegetation (according to the construction set-back rules established by the state's Coastal Area Management Act), I found that I did not think it was far enough away from the shoreline.

I was impressed with the many different species that lived on such a small island, and how they all adapted to the rough life. Plants adapt to environment by aggressive root systems, wind resistance, bending, and resistance to salt spray, drought and heat tolerance.

The high tide and storm tide are quite different from each other. I can tell the storm tide by some of the debris that has washed up and been caught on vegetation. The storm tide looks even worse in some places that seem to wash away and carry on water during large surges.

CARRINGTON EDMUNDS, ***a senior from Davidson majoring in chemical engineering***

It was interesting to note the wide differences between the regions of a barrier island. As we moved across the dunes, I noticed several different types of wildlife. I noticed a large ant lion. These particular animals create a funnel of sand that traps ants. As the ants funnel down the sand, the ant lions trap the ants in their jaws. This was amazing to watch.

As we crossed the dunes, we noticed some higher dunes and rested our stomachs on the dune structure. When the wind blew, I noticed the light sand whip across the top of the bare dune. It was interesting to note that as we moved further inland, the sand seemed to be less dense and had a really nice consistency to it. It was fine and almost white in color.

As we moved away from the range of salt spray and into the maritime forest, I noticed the presence of live oaks, red bay, wax myrtle and a toothache tree. When the leaves of the toothache tree are on your tongue, they give a tingling feeling.

As we walked around the island, I noticed an inlet hazard area. In this area, you could see just how dynamic the inlet could be. This was evident by the undercutting of the trees that once held the bank in. Fallen trees covered an area from the high bank to the water's edge.

As we walked, the highlight of the trip happened: Walter noticed an octopus in the water. I have never seen one before. It was a beautiful animal that changes colors as it moves. Another reason why this animal was so magnificent was its jet propulsion system. Octopi use jet propulsion to propel themselves through the water.

LANDON LASMITH, ***a senior from Greensboro majoring in computer science***

We begin walking over and across sand dunes pointing out all the plants that we see. There is an abundance of trees that died because of sea spray from the last storm. Certain parts of the island look like dead zones because the trees are gray and lifeless.

Nancy Cowal

Nancy Cowal

FROM FAR LEFT:

Kris Clinard's collection highlights the diversity of barrier island vegetation.

The discovery of an octopus in shallow waters invites close inspection.

Lundie Spence, kneeling, and Walter Clark, right, embark on a barrier island adventure with NC State students.

Niel Hardison and Stuart Carney observe the effects of the dynamic Bogue Inlet currents.

We get to the high sand dunes, and Lundie talks about fulgurites. Fulgurites are the term used when lightning strikes the sand and heats the sand up to the point where silicon forms in the sand.

As we're standing on the top of the dune, I see the whole island, and it is a beautiful sight.

We make our way out of the maritime forest and onto what looks like a big rice field. I soon find out this is a salt marsh. Walter told half of us to jump up and down, while the other half stands still. The marsh shakes under our feet. He explains to us that this is caused by peat compacting when jumped upon. This marsh is covered by peat and glasswort. The glasswort is very interesting because it is a type of pickle, and it's edible.

We trek across the salt marsh at low tide, ankle-deep in mud. We make it to the edge of the island and stop on what seems to be an oyster burial ground because the shore is littered with old oyster shells. Lundie tells us the Algonquin Indians would bring oysters they caught here to them break open.

Our group is most determined because we rush to finish all the exercises in the least amount of time. We identify 15 seashells native to the island, study the shore currents' speed and direction, identify plants seen as natural, stable vegetation, and find out where the setback line would be if we could build a house on Bear Island.

This is the fun part. We finally get to walk through the salt marsh at high tide. There is nothing like the smell of a fresh salt marsh early in the morning. We study the salinity of the water close to land and observe the saltwater and freshwater plants.

AS THEY SEE IT

The Hammocks Beach State Park/ Bear Island complex is a perfect classroom — sustainable tourism at its best, say Spence and Clark. Being there, they explain, can mean the difference between simply knowing and really understanding the natural processes and the policies.

In class, a formula on a chalkboard is the best you can do to illustrate building set-back rules prescribed by the North Carolina Coastal Area Management Act, Clark says.

"But, it's a different picture when you actually step off 60 or 90 feet from the first line of stable vegetation — within view of the ocean and signs of change. They can appreciate just how vulnerable man-made structures are."

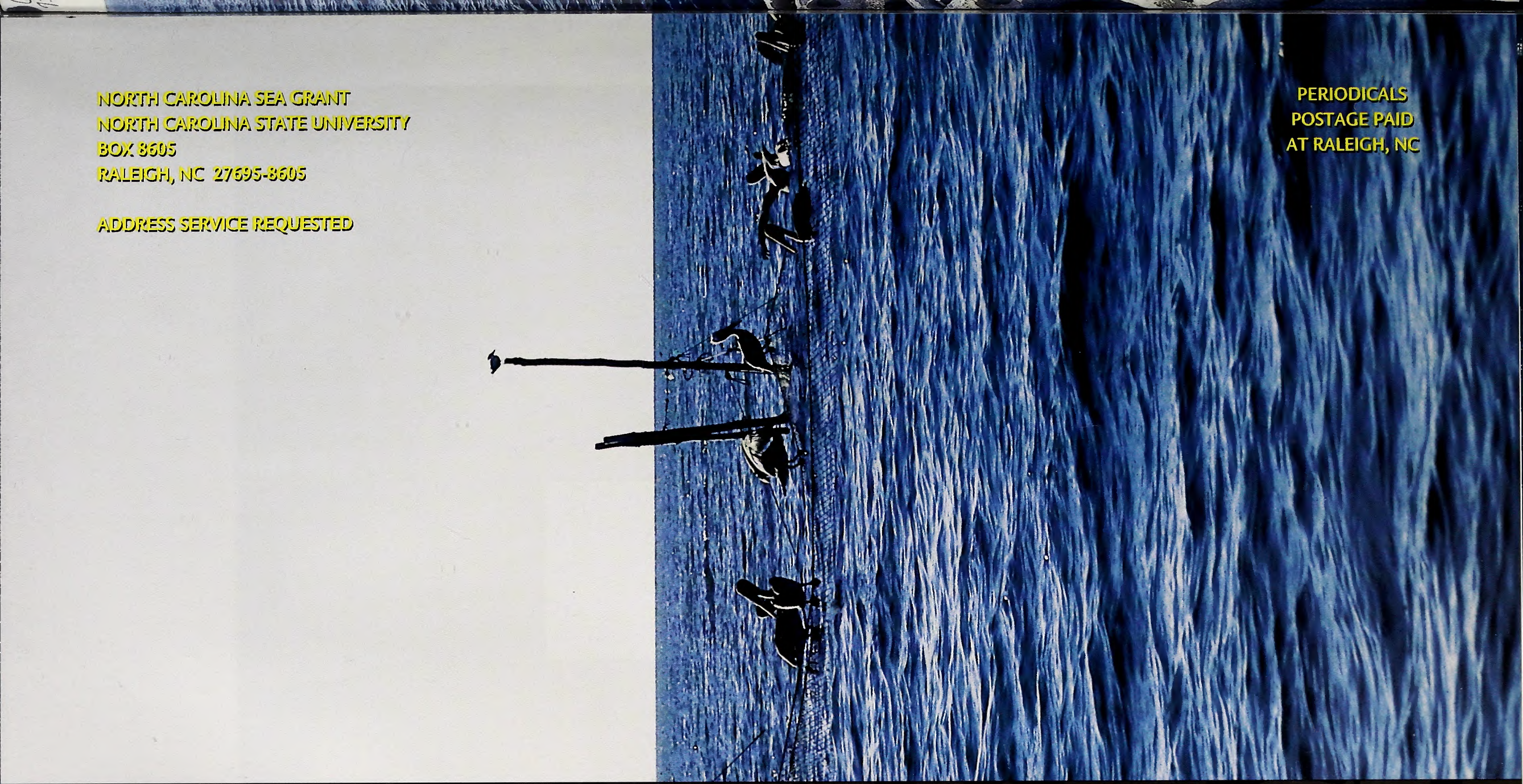
Students gain a new perspective on ecology and management issues from the vantage point of a high dune on this undeveloped barrier island. Bear Island has some of the most spectacular, intact dune fields in North Carolina, says Spence.

Students learn that CAMA rules apply only to the edges of developed barrier islands — the ocean hazard zones and the wetland sides. Management rules don't protect the core of an island — including dune fields and maritime forests that are not designated areas of environmental concern, Clark adds.

But no legislation can protect a maritime forest from nature itself. The Bear Island maritime forest was decimated by Hurricane Fran in 1996. Now students see the beginning stages of its recovery.

Spence and Clark say there is no way to measure the impact of a single field trip.

"But we can be certain of one thing," Spence offers. "They learn that there's more to the beach than surfing or getting a tan. They will never go to the beach with the same eyes. They understand about wave energy, the sand dunes and the tides." ◆



NORTH CAROLINA SEA GRANT
NORTH CAROLINA STATE UNIVERSITY
BOX 8605
RALEIGH, NC 27695-8605

ADDRESS SERVICE REQUESTED

PERIODICALS
POSTAGE PAID
AT RALEIGH, NC

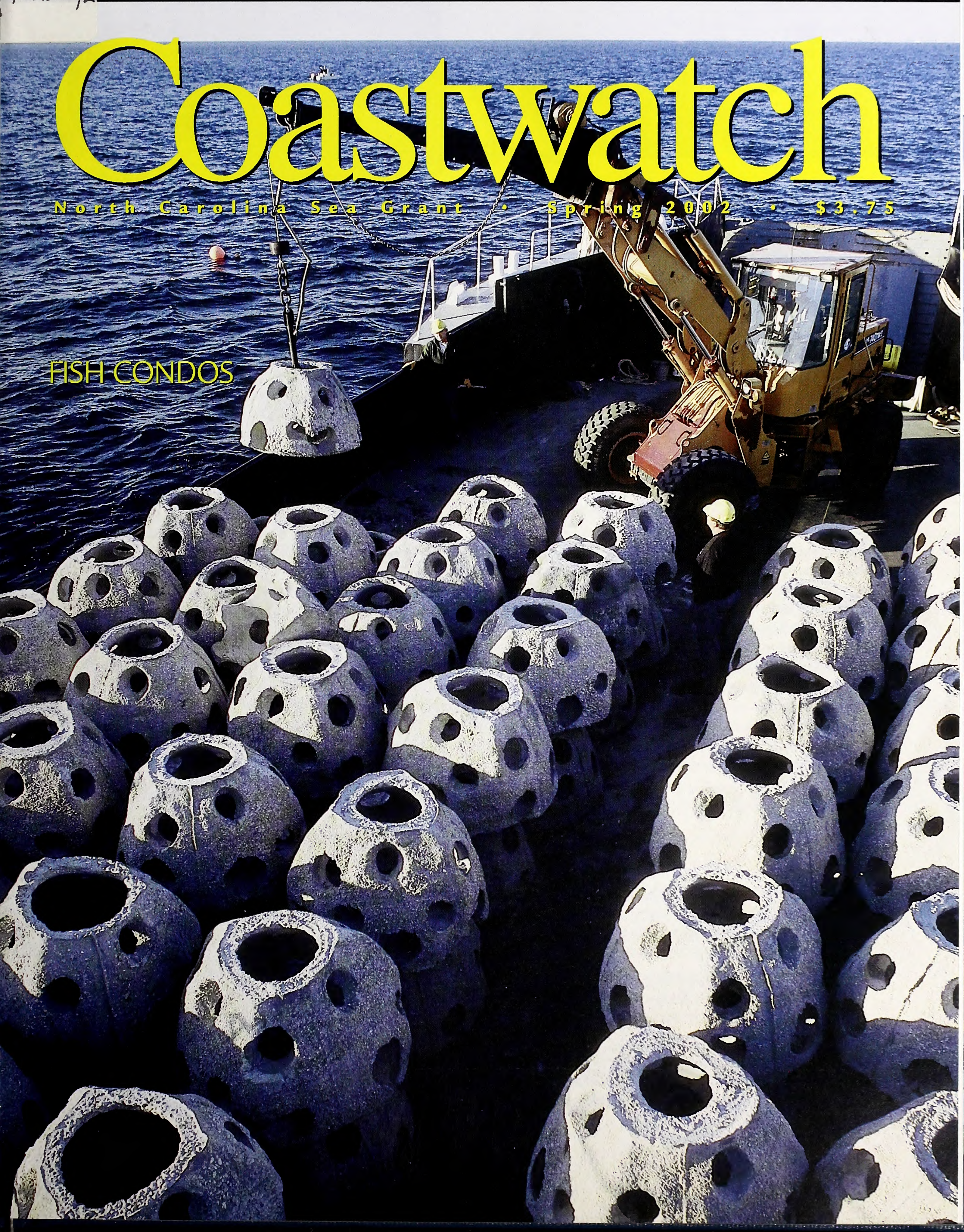
COASTWATCH

G69
7: 2002/2

DE COUNTY • SHELLFISH CLOSURES • PELICANS

Coastwatch

North Carolina Sea Grant • Spring 2002 • $3.75



FISH CONDOS

FROM THE EDITOR

Ocean Perspectives

Herman Lankford

What are the most important ocean and coastal issues facing the United States?

In the late 1960s, that question was posed to the Stratton Commission. Appointed by Congress, the commission completed its 30-month task by producing a report, *Our Nation and the Sea,* in 1969. The commission made 120 recommendations — and the results include the creation of the National Oceanic and Atmospheric Administration, better known as NOAA, in 1970 and the National Coastal Zone Management Program in 1972.

More than 30 years later, a new federal commission is looking at the current status of our ocean and coastal resources — and the role of federal agencies in addressing these issues. The U.S. Commission on Ocean Policy is in the midst of a series of public hearings, gathering information from each coastal region.

In the first regional meeting — held in Charleston, S.C., in January — the presenters offered several common themes. One was science, from studies of development impacts on coastal estuaries to exploration of the great ocean depths. In fact, several speakers noted that, on the whole, we know more about the moon than we do about our oceans.

Another recurring theme was education, from putting ocean themes into classroom lessons to helping the general public better understand coastal and marine ecosystems.

The changing demographics at the coast makes the public education item crucial, according to Michael Orbach, director of the Duke University Marine Laboratory.

Not only is the coastal population significant, Orbach told the panel, but it is still growing. Many new residents are retirees arriving from interior counties and states — folks who did not grow up with hurricanes and beach erosion, and thus need reliable information on these and other topics.

Finally, guests and commission members alike encouraged the commission to "think boldly" as it gathers information and formulates recommendations. If you would like to learn more about the commission, go online to *www.oceancommission.gov.*

While the ocean commission is gathering a national perspective on coastal topics, *Coastwatch* will continue to give you new perspectives on the North Carolina coast.

In some cases that perspective is geographic. Not long ago, a reader explained that while he knows one region of our coast quite well, he sometimes is unfamiliar with a location featured in the magazine.

You can see our response at the bottom of this page — a locator map to help readers identify the places we mention in our stories. Often, our stories use one location to illustrate a more general topic. Sometimes the entire story focuses on a particular place.

In your coastal journey this issue, we take you to Hyde County, a place forever etched in the memory of Carlos Fetterolf of Michigan, a member of the National Sea Grant Review Panel. Now 75, he was barely a teen when he and his father set out from New Jersey to hunt at Lake Mattamuskeet — a crown jewel of Hyde County folklife.

His first shot with the double-barrel shotgun literally knocked his cap off. Later that day, he spotted geese close to shore.

"I crawled through the reeds and muck on my belly. But as I drew nearer, I was embarrassed to realize that geese weren't the only animals fooled by hunters' decoys," he recalls.

Katie Mosher, Managing Editor

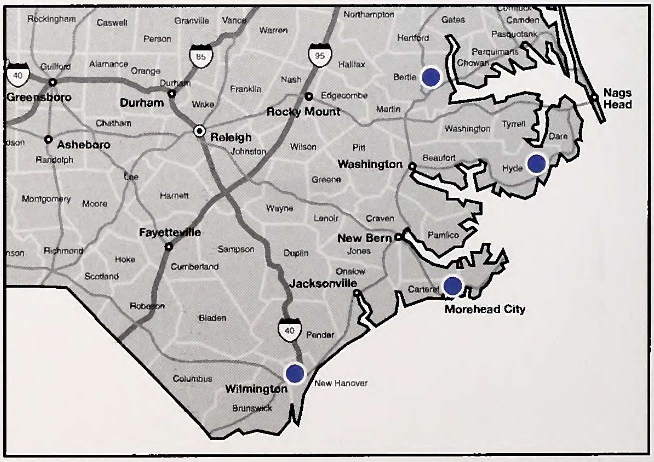
IN THIS ISSUE

Contributing Writers:

Ann Green ▫ Cynthia Henderson ▫ Lisa Kowite
Katie Mosher ▫ Pam Smith

Contributing Photographers:

Walker Golder ▫ Cynthia Henderson ▫ Herman Lankford
Jim Rice ▫ Doug Smith ▫ Pam Smith ▫ Scott D. Taylor



North Carolina's diverse coast offers countless interesting subjects. The large dots on the locator map indicate story settings in this issue — from northeastern counties of Bertie and Hyde to New Hanover and Brunswick counties in the southeast.

Coastwatch

N.C. DOCUMENTS
CLEARINGHOUSE
APR 3 2002
STATE LIBRARY OF NORTH CAROLINA
RALEIGH

FEATURES

COASTAL TIDINGS 2

ARTIFICIAL REEFS:
FROM SHIPWRECKS TO REEF BALLS

North Carolina has one of the premier state-managed artificial reef programs in the country. Pam Smith takes us along on a recent deployment of reef balls by the N.C. Division of Marine Fisheries. 6

GETTING TO THE HEART OF HYDE COUNTY

Folklorist Bill Mansfield helps readers discover the treasures of the Hyde County mainland — the people who keep the heritage alive. We meet the heroes of his new book, featuring photos by Scott Taylor. 12

SHELLFISH CLOSURES:
SIGNS OF TROUBLED WATERS

Nothing could be finer than a plate of succulent North Carolina oysters, clams and mussels. They're good to the taste buds and for the economy. But when shellfish waters are closed because of pollution, there are more than consumer and economic implications. Cynthia Henderson tells how closures affect the people who work on the water. 17

PEOPLE AND PLACES:
Hope Plantation: Explore Historic Treasure

Tour Hope Plantation in Bertie County with Ann Green. The historic site, which focuses on the rich history and culture of the region, features the stately mansion built by David Stone, who served as governor from 1808 to 1810. 21

SEA SCIENCE:
New Research Projects Reflect Sea Grant Spectrum

North Carolina Sea Grant is supporting a new round of research projects, each aimed at a particular aspect of our coast and its vast resources. Learn how Sea Grant research continues to have an impact on coastal issues. 23

NATURALIST'S NOTEBOOK:
North Carolina: Pelican Paradise

Pelicans are peculiar birds. Lisa Kowite tells us about some of their unique quirks — and how they are being protected by vigilant groups in North Carolina. 26

Coastwatch

Managing Editor
Katie Mosher

Senior Editors
Ann Green
Pam Smith

Contributing Editor
Cynthia Henderson

Designer
L. Noble

Circulation Manager
Sandra Harris

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 15-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

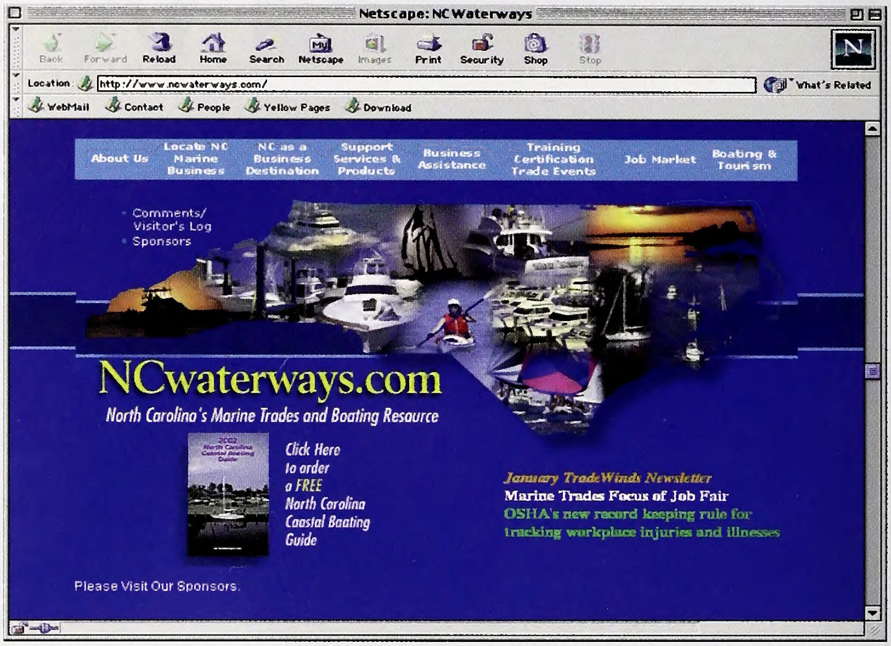
Coastwatch (ISSN 1068-784X)
is published six times a year by the
North Carolina Sea Grant College Program,
North Carolina State University, Box 8605,
Raleigh, North Carolina 27695-8605.
Telephone: 919/515-2454. Fax: 919/515-7095.
Subscriptions are $15.
E-mail: katie_mosher@ncsu.edu
World Wide Web address:
http://www.ncsu.edu/seagrant
Periodical Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to
Coastwatch, North Carolina Sea Grant,
North Carolina State University, Box 8605,
Raleigh, NC 27695-8605.

Sea Grant
North Carolina

Front cover photo of reef balls by Scott D. Taylor. Table of Contents photo of oysters by Michael Halminski. Printed on recycled paper.

COASTAL TIDINGS



http://www.ncwaterways.com/

NCwaterways.com

North Carolina's Marine Trades and Boating Resource

Click Here to order a FREE North Carolina Coastal Boating Guide

January TradeWinds Newsletter

Marine Trades Focus of Job Fair

OSHA's new record keeping rule for tracking workplace injuries and illnesses

Please Visit Our Sponsors.

N.C. Marine Web Site Highlights Industries

North Carolina's maritime industries are about to get a boost from the new Web site, *www.NCWaterways.com*.

Visitors to the site can search for marine trades educational materials, tourist information, recreational water events and more. Individuals also may post resumes or browse through updates on workshops, products and services.

N.C. Marine Trades Services — part of the state's Small Business and Technology Development Center or SBTDC — is developing the site to promote North Carolina's marine businesses on a local and national level.

Due to be completed soon, many search options, including locating businesses and tourism information, are already available. The site will offer a database of business products, services and materials — with searches by company name, region, product or service.

Mike Bradley, N.C. Marine Trades Services director, is enthusiastic about the site's development. With it, North Carolina may earn a more prominent spot on the map as a boating and maritime business destination, he says.

The Web site development is funded primarily through a grant from the Golden LEAF Foundation. The SBTDC also will work to keep existing jobs and to encourage the growth of new jobs and businesses in North Carolina's maritime industries. — L.K.

In the Next Issue of *Coastwatch*

Batten down the hatches — hurricane season starts soon. Ann Green teams with Sea Grant's Spencer Rogers to demonstrate retrofitting techniques that make coastal structures more storm resistant. Also, The Coastal Society celebrates 25 years as a leading international organization for professionals in coastal management and policy — and Sea Grant's Walter Clark is the current president. Learn how members are affecting change.

New Kayak Maps Available

Paddlers can find their way around Crystal Coast waters easily thanks to the efforts of the Crystal Coast Canoe and Kayak Club.

The club's map describes paddle trails and put-ins along the White Oak River – from the Maysville/Belgrade area to Bogue Sound.

The map was produced with assistance from local outfitters and Crossroads, a Beaufort-based citizens' group, and a grant from the N.C. Division of Parks and Recreation.

The maps are available free of charge from CCCKC, the Carteret County Tourism Development Bureau and the N.C. Division of Parks and Recreation.

To request a free map, send e-mail to *vacation@sunnync.com* or *darrell.mcbane@ncmail.net*.

Planning has begun for a second map that will focus on Bogue Sound from Emerald Isle to Morehead City – possibly including Goose Creek, Broad Creek and the Newport River.

For additional information about CCCKC and paddling in the Crystal Coast area, send e-mails to *info@cckc.org*, or visit the club's Web site at *www.cckc.org*. – P.S.

Venomous Lionfish Found Off N.C. Coast

photo by Paula Whitfield (NOAA Beaufort Laboratory)

Divers and fishers who venture to waters off the North Carolina coast should steer clear of lionfish that have been spotted near shipwrecks. While the fish is appealing to the eye, its venomous spines are dangerous to humans and other fish.

Sightings of the Pacific fish should be reported to experts at the National Oceanic and Atmospheric Administration (NOAA) laboratory in Beaufort. Scientists want to determine the number and range of the lionfish in the southern Atlantic waters. The species is *Pterois volitans*, a popular saltwater aquarium fish.

Local divers first reported the sightings last year. The number of observations and distance between sightings suggest that more lionfish may be found off the coast and that they may be able to survive the winter water temperatures.

"Now that scientists have positively identified the species, we need to determine the distribution of lionfish along the southeastern United States," says Bill Hogarth, director of the National Marine Fisheries Service (NOAA Fisheries).

The scientists want to know if the fish are reproducing in the Atlantic waters. Beaufort Laboratory researchers also will focus on age and growth of the species along with their food habits. Then officials will ascertain what steps, if any, may be necessary to halt the spread of this species.

NOAA Fisheries is working with NOAA's Ocean Service to alert divers and fishers not to touch the lionfish. But photos of Atlantic sightings will help the NOAA research effort.

For more information or to report a sighting, contact Donald Hoss, director of the NOAA Beaufort Laboratory, 101 Pivers Island Road, Beaufort, NC 28516-9722; phone, 252/728-8746; fax, 252/728-8784; e-mail, *don.hoss@noaa.gov*.

If possible, provide coordinates of where the lionfish was seen, and at what depth. Also provide any photos from the sighting. – K.M.

Scott D. Taylor

Coastal Paddling Publications

In coastal North Carolina, paddlers can navigate more than 1,200 miles of water trails – from the brackish marshes on the Alligator River to Lake Phelps with its towering bald cypress.

When navigating waterways, paddlers have an economic and environmental impact on northeastern communities.

To enhance paddling opportunities in coastal communities, the North Carolina Coastal Plains Paddle Trails Initiative recently completed a series of projects, including a paddler's survey, research proceedings, printed guide and Web site: *http://ils.unc.edu/parkproject/nctrails.html*.

Copies of the survey, final report and conference proceedings are available from North Carolina Sea Grant. To order printed guides and publication copies, call 919/515-9101. Refer to *NCCPPTI The State of North Carolina Paddling Survey*, UNC-SG-Ol-06; *NCCPPTI 2001 Coastal Plains Paddle Trails Research Conference Proceedings*, UNC-SG-01-07; and NCCPPTI Final Report, UNC-SG-01-08. – A.G.

Scott D. Taylor

State Acquiring Bird Island

If all goes according to plan, Bird Island soon will become the N.C. Division of Coastal Management's tenth designated coastal reserve. In late December 2001, officials closed on the first half of the $4.2 million purchase option for the 1,200-acre, undeveloped island.

The Price family of Greensboro agreed to sell the island to the state over a two-year period. The $2 million first installment came from grants from the N.C. Heritage Trust Fund and the N.C. Clean Water Management Trust Fund.

"We are confident that we will identify the resources to complete the deal this year," says Brian Long, a coastal management spokesperson. The division will seek the balance from state or federal sources.

Bird Island is located in Brunswick County, between Sunset Beach and South Carolina. A portion of the island that extends over the state line is owned and protected by the U.S. Army Corps of Engineers. The island once was accessible only by boat, but a land bridge to Sunset Beach formed when Mad Inlet closed in recent years.

The site teems with wildlife — including visits from migrating wood storks. It also attracts boaters, anglers and beach lovers, says John Taggart, director of the N.C. Coastal Reserve System.

Though research and education are primary missions for reserves, the public will continue to be invited to enjoy the island's recreational bounty, Taggart says. — P.S.

Study Finds Low Oxygen Levels Slow Fish Growth

North Carolina Sea Grant researchers have found that low oxygen levels in North Carolina estuaries can slow the growth rate of juvenile fish and shrimp.

Led by North Carolina Sea Grant researcher James Rice, the scientists found 31 to 94 percent lower growth rates in fish exposed to low levels of oxygen — or hypoxia — which often occurs over large areas of our estuaries during the summer. Shrimp growth rates were 20 to 25 percent below normal. This study has important implications for fishery resource managers because most of North Carolina's commercial and recreational fisheries are dependent on estuarine nursery areas.

"Problems associated with low oxygen in estuaries may affect fishery production, even when you do not see massive fish kills," says Rice, a North Carolina State University zoology professor.

The researchers determined that even when fish avoid low oxygen areas they migrate to other habitats, resulting in high density.

"Our field experiments show that overcrowding can lead to lower growth and survival rates in fish, even if there's plenty of oxygen in the water," says Rice.

For some species, the effects of hypoxia may be more pronounced, reducing the density of benthic food organisms.

Rice and his graduate students are working with Sea Grant scientists in Louisiana and Delaware to determine how temperature and oxygen levels combine to affect fish movement behavior, growth, and survival.

The researchers hope to develop a computer model from their results that will help managers better understand how fish populations will be affected by water quality changes.

To learn more about new North Carolina Sea Grant research projects, see page 23. — A.G.

SEAS Expo Set for April

Courtesy of SEAS

Are you curious about what lies within the deep blue sea?

Then join all levels of divers, including national experts, at the Seas 2002 Scuba Expo to be held April 6 - 7 in Raleigh.

Sponsored by a variety of dive shops around the state, the expo will be held at the McKimmon Center at North Carolina State University.

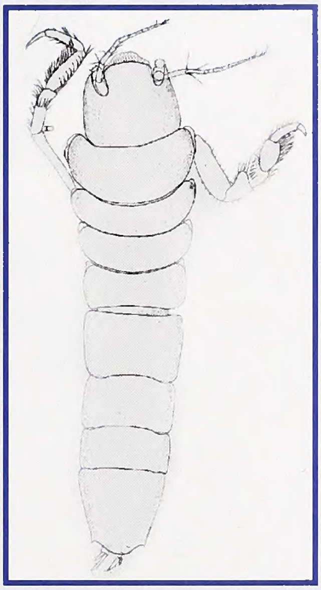
Exhibits will include information on the latest equipment and on dive locations from North Carolina to exotic locales. Educational booths will include North Carolina Sea Grant, the Divers' Alert Network and groups interested in marine preservation.

A pool will be available for first-time introductory dives or to test new equipment. There is a special "Sea Urchins" program for youngsters. And winning entries of an underwater photography contest will be on display.

Advance tickets are $7 per person. Admission is $10 at the door. Each Sea Urchins session — which includes fish printing on T-shirts, educational programs, and a chance to try kid-friendly gear in the pool — is $8 per child.

For ticket sale locations and a complete schedule, including seminars, check the Web at *www.seas-expo.com* or send an e-mail to *seas@ipass.net*. — K.M.

UNC-W Professor Makes Deep Sea Discoveries



UNC-W

A University of North Carolina at Wilmington professor of biological science has made remarkable discoveries in the five-mile deep ocean waters off Cape Hatteras — thousands of marine organisms.

Robert George outlined two new genera and six new species of crustacea in the paper published in the December 2001 *Journal of Natural History*.

Among his finds is the deep-sea isopod *Leutziniscus jebamoni*, named in honor of UNC-W Chancellor James R. Leutze, known for his concern for coastal environment. This lobster-shaped organism, about the size of a pencil eraser, was captured four miles deep in the Hatteras abyssal plain.

George made his deep-sea discoveries during an expedition organized by Duke University's Nicholas School of the Environment at Beaufort. Samples that included the Leutze genus were collected from the ocean floor by a remote robotic device.

"The deep-sea area off of North Carolina is rich in diversity much like that of a tropical rain forest," says George. "There are probably thousands of species living within a square mile area at or near the ocean floor."

Greater study is needed to fully understand the commercial implications of this area, that includes 30- to 40-foot coral reefs, he says.

– P.S.

Sea Turtle Recovering at Topsail

A sea turtle coming ashore at Topsail Beach is not unusual. But, when the turtle arrives by plane, that's news.

The green sea turtle was flown to the nationally respected Karen Beasley Sea Turtle Rescue and Rehabilitation Center in late December.

The small creature was found Dec. 2 on Maryland's southern shore with a severely injured front flipper and suffering from exposure to cold water. Initially, he was taken to the National Aquarium in Baltimore, but was flown to the Topsail facility for long-term care.

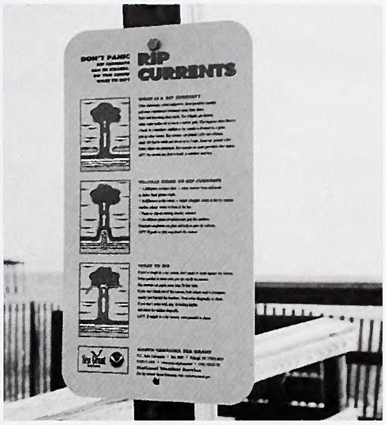
It's estimated that the turtle, nicknamed "Baltimore," is between 2 and 4 years old. According to Jean Beasley, hospital director, "His right front flipper was cut off above the paddle — a tremendous handicap."

A special tank was constructed to provide sufficient space for Baltimore to maintain his deep-diving ability. "He is using the flipper vigorously, and it is slowly healing," Beasley says. "But the jury still is out on his ability to survive in the wild because so much of his flipper is missing."

If not, Beasley's organization will search for permenant placement. "Any institution must make a lifetime commitment. Remember, a turtle can live a hundred years," she says.

The sea turtle hospital relies on the support of volunteers and private donations. In addition, the nonprofit hospital will receive $10 for each "Save the Sea Turtle" license plate being offered by the N.C. Department of Motor Vehicles. Applications are available from DMV, or can be downloaded from the sea turtle hospital Web site at *www.seaturtlehospital.org*.

– P.S.



Doug Smith

Signs Continue Rip Current Safety Project

Communities along the North Carolina coast are joining a Sea Grant effort to teach visitors and residents about the dangers of rip currents.

The communities are posting hundreds of aluminum rip current signs at beach access points, lifeguard stations and other locations along the shoreline. The 11-inch by 20-inch signs are a project of North Carolina Sea Grant, in conjunction with the National Weather Service.

The education effort includes brochures and posters, as well as weather service Web sites that give daily updates on the threat of rip currents along various stretches of shoreline during the beach season. Later this spring, go to *www.ripcurrents.noaa.gov*, to link to specific weather service sites.

In addition to the towns' efforts, Sea Grant anticipates the signs will be posted at hotels, parks and rental properties.

Signs ordered this spring will be $12 each, but the price is expected to increase because of materials costs. All orders and payments will be handled by the Sea Grant headquarters in Raleigh. Call Sandra Harris at 919/515-9101 or e-mail *harriss@unity.ncsu.edu*.

– K.M.

ARTIFICIAL REEFS:

From Shipwrecks to Reef Balls

BY PAM SMITH

The wake-up weather and traffic forecast is on target. Day breaks crisp and clear, and traffic is heavy on Wilmington's Shipyard Boulevard.

At the port, the security guard checks our photo identification and matches names and Social Security numbers to her clearance list: North Carolina Sea Grant/ *Coastwatch* writer and photographer. Check.

She directs us to a fenced area where we'll rendezvous with Jim Francesconi, coordinator of the N.C. Division of Marine Fisheries' Artificial Reef Program. If the weather holds, we'll observe the delivery of 130 artificial "reef balls" to Artificial Reef Site #372, about five miles off the Masonboro Inlet Buoy. Members of the Wrightsville Beach King Mackerel Tournament organization, the deployment sponsors, will provide some of the muscle power.

We're first to arrive at the staging area and have a chance to get a close look at the rows of strange-looking reef balls. These so-called "fish condos" are designed to allow fish and other marine life to move freely through side and top holes. Reef balls receive high grades from recreational fishing clubs that are seeking to create fish habitat on near-shore ocean bottoms.

In a far corner of the staging area, we spot stacks of concrete sewer pipe acquired by the Long Bay Artificial Reef Association — a principal player in the state's artificial reef program. The pipe sections supplement the placement of 2,700 tons of reef material the organization financed in 2001 as part of its ongoing reef enhancement campaign.

Both clubs' deployments have been delayed several weeks by unpredictable weather, marked with rough seas and high winds. This is an opportunity to make up for some of that lost time.

The staging area soon is alive with activity with the arrival of Francesconi and DMF colleagues. Rita and Mike Merritt lead the Wrightsville Beach King Mackerel Tournament volunteer contingent.

The plan for the nonstop day is to move the reef balls by flat bed truck to Berth 8, where they'll be hoisted aboard DMF's *Research Vessel Long Bay,* a converted military landing craft. Once loaded, the vessel will move along the Cape Fear River to Masonboro Inlet and open ocean waters bound for AR-372 — if time allows and seas remain calm.

Francesconi is optimistic on both counts.

SO FAR, SO GOOD

Rita Merritt lived with the ocean all her life and understands its fickle nature. Having to wait another day for a safe deployment won't deflate her excitement.

The organization has been involved with the artificial reef program since its early days, when it supported the deployment of several salvaged vessels. "The idea is to put something back into the community," Merritt explains. "We heard about the new technology and materials, and saw the impressive work the Long Bay Artificial Reef Association is doing in Brunswick County with reef balls. Our board members agreed that investing in reef balls is another way to go."

It's an investment with tangible paybacks. She explains that reef balls are food chain catalysts. Once the structure is colonized by marine organisms, small baitfish move in — followed by larger fish prized by anglers.

The initial investment of $15,500 raised from the 2001 tournament was enough to purchase and transport 100 reef balls. Individual donations brought the total to 128, and the Florida-based manufacturer added two to allow for breakage en route.

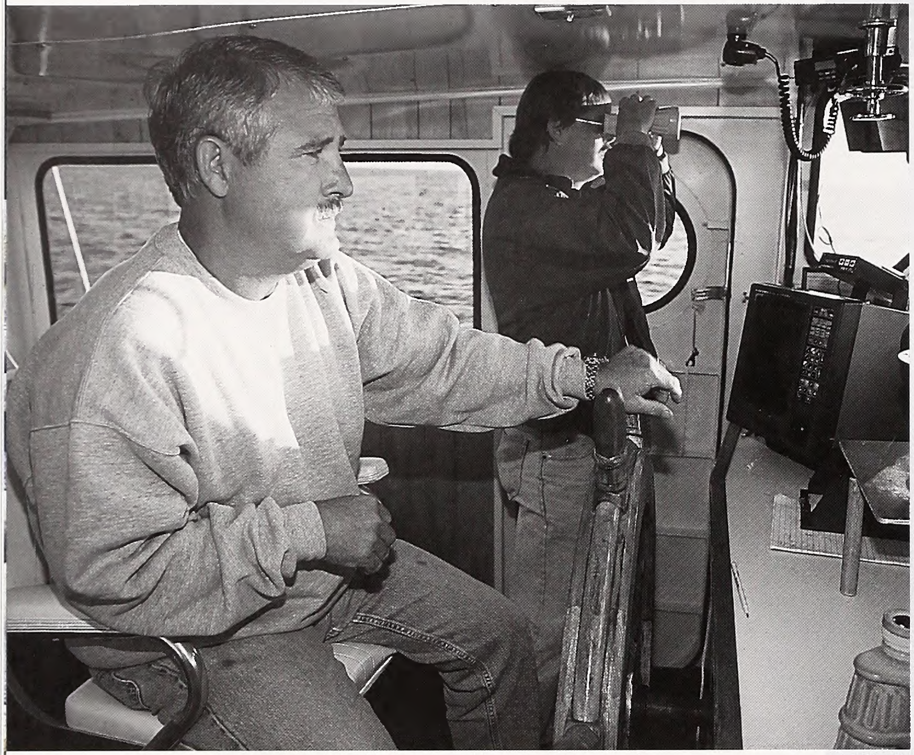
"We've already received pledges for our next deployment," she says. "The more good material you can place on the site, the more fish you'll attract."

There's a lot of room for enhancement at AR-372. The site has been permitted since the mid-1980s. Ten railroad boxcars were sunk in 1986, but nothing more was added until 1990 when two barges and boat molds were deployed.

Each artificial reef buoy is assigned a Global Positioning System "address" for follow-up monitoring by DMF — and for easy location by anglers.

"So, if you see a cluster of small fishing boats, and wonder how they know that's where the fish are, it's likely the boats are over an established artificial reef site," Merritt says. "It's a terrific program, with so many possibilities."

Continued



Scott D. Taylor

Aboard *R/V Long Bay,* Capt. Davie 'D.R.' Guthrie and his mate spot AR-372 Buoy, five miles off Wrightsville Beach.

Nothing would happen, she says, if it were not for the partnership of the DMF with the State Ports Authority and stevedores to provide port clearance, space, equipment and heavy lifting needed to get reef materials out to permit sites.

Francesconi would argue that Merritt leaves out the most important factor in the partnership — the involvement and financial support of the recreational fishing community.

But it hasn't always been as systematic.

LEARNING FROM HISTORY

It could be said that North Carolina's artificial reef program began when the earliest sailing vessels sank to the ocean floor to create a spontaneous marine habitat.

But a more "managed" artificial reef program came along with the implementation of the National Artificial Reef Plan in 1985, mandated by the National Fishing Enhancement Act enacted the previous year. The goal was to enhance fish habitat — and ultimately fisheries stocks.

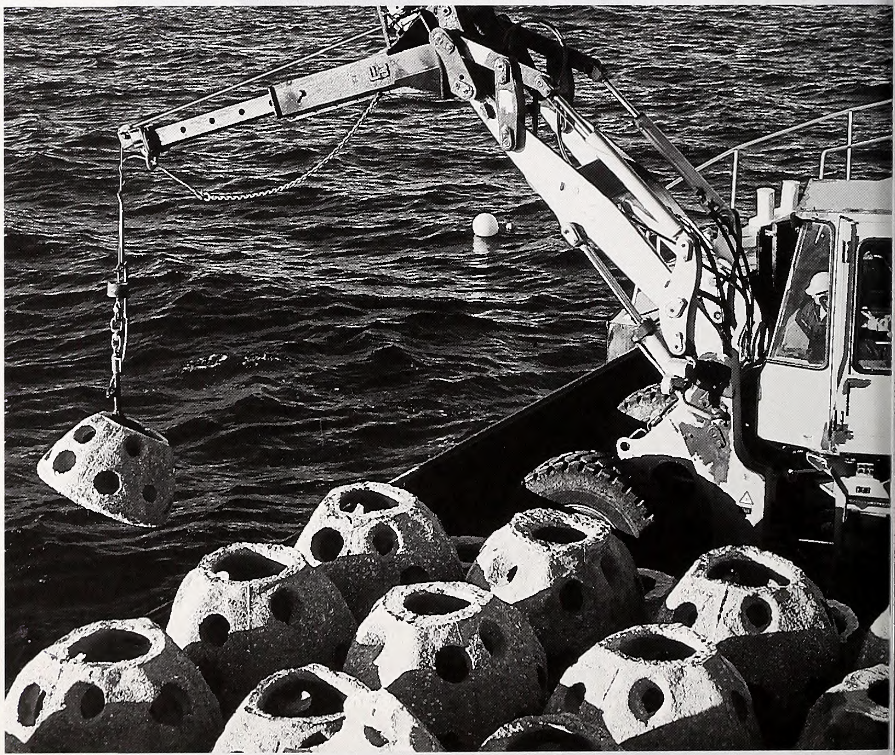
Early on in North Carolina, permits were held by sport fishing clubs, but the permits were acquired by the state in 1985 when DMF became the state's management agency. Now, DMF maintains 39 ocean sites — about two-thirds are located from Cape Lookout south. Only three ocean sites are more than 20 miles offshore. DMF also oversees seven estuarine reefs in sounds and rivers.

Reef-building efforts were sporadic for many years. Four decommissioned warships were sunk off the coast in 1974, authorized by the U.S. Liberty Ship Act. But little large-scale activity took place until 1986 when hundreds of railroad box cars were donated for use on artificial reef sites.

"Through the years, the box cars deteriorated, and their sides have fallen in on themselves, offering little habitat advantage," Francesconi says.

Some good ideas ended badly. He recounts one project that took thousands of tires from landfills to use as reef material. Tires were bundled using two kinds of metal straps — one of a noncorrosive material, the second of a corrosive metal. The premise was simple. One strap would permanently bind them, the other strap eventually would fall away, enabling the less restrained side to provide additional habitat surfaces.

Unfortunately, even the noncorrosive straps were no match for ferocious ocean storms. And thousands of tires were unleashed — some all at once, some over time — to foul fishing nets and litter beaches. Never again,



Scott D. Taylor

The first of 130 artificial reef balls takes the plunge onto the reef site. The prefabricated structures come in three sizes.

vowed artifical reef proponents.

Through the years, a virtual fleet of vessels — from military ships to fishing boats — have been placed on reef sites. Obsolete military planes also add dimension to some sites. But ships can cause other headaches.

"It has become cost prohibitive to clean the paint, PCBs, asbestos and other toxic materials from ships," Francesconi notes. On average, the cost of stripping and cleaning is $30,000 for a small vessel up to hundreds of thousands for a large military vessel.

Ideally, reef material should provide high relief on flat bottoms, Francesconi explains. "The more edge — the boundary between reef material and expanse of sand — the higher the productivity of desirable fish species."

That's why some fishing organizations began to invest in reef balls in recent years. Francesconi also continues to scout for other "clean" material that may be available — storm sewer pipe, bridge superstructure and concrete rubble.

A barge stripped of mechanical elements also is suitable as a platform for high profile materials anchored to its deck in concrete.

Scott D. Taylor

Rita Merritt says the Wrightsville Beach King Mackerel Tournament is ready to invest in reef balls.

NEW LIFE, OLD SCHOOLHOUSES

Jim Bahen, North Carolina Sea Grant recreational fishing specialist, jokes about having taught on an artificial reef. The barge, *Alton Lennon*, once was a classroom at Cape Fear Community College. It now sits in 78 feet of water off Masonboro Inlet at AR-386, otherwise known as "Schoolhouse Reef."

"There is no doubt that we are seeing unusual fish around artificial reefs — bigger fish and more tropical species," Bahen says.

Mac Currin, a recreational angler and member of the state's Marine Fisheries Commission, calls artificial reefs "wonderful devices."

"They identify discrete near-shore areas that have bottom structures that the small boat owner can access," Currin says. "They have given life to areas previously without habitat structures and are heavily utilized."

North Carolina's program is one of the premier state-managed programs in the country, Bahen adds. "It's a good story of partnerships with positive results. With no recreational fishing license fee, DMF relies on the clubs to purchase the material and pay for its transportation to the port. The recreational fishing clubs stepped up to provide the financial support for the well-organized DMF program."

Artificial reefs also get high grades from divers who appreciate the diversity of marine life that swarms about artificial reefs.

Just ask Roy Taylor, co-owner of Aquatic Safaris & Divers Emporium in Wilmington, who has been diving for more than a decade.

As a marine biology major at the University of North Carolina at Wilmington, his senior project was on the productivity of artificial reefs. He was there to video life on the *Markham,* a 320-foot dredge, just after it was deployed in the mid-1990s onto AR-386, "Schoolhouse Reef." Two days later, he was documenting the presence of fish.

"Now a few years later, it is one of my favorite diving destinations," he says. It is fully encrusted with algae and barnacles. "It is truly a sea fantasy with species such as the Christmas tree worm, the colorful damsel, butterfly and angel fish."

His conclusions about artificial reefs, then and now? "Artificial reefs attract an abundance of marine life," says Taylor.

STEADFAST EFFORTS

The Long Bay Artificial Reef Association was the first to "step up" to support the program. When the organization was chartered in 1984, it held one artificial reef permit under old regulations. Under the new program, it "sponsors" seven artificial reef sites.

"Once you plant a reef, it's not going away. The community continues to reap benefits," says Dale McDowell, Long Bay president.

Along the Brunswick County coast, recreational fishing was not a big tourist draw before the club began its reef enhancement program, he says. "Now, a big money King Mackerel tournament attracts professional kingsmen," McDowell says.

Enhancing the artificial reefs makes economic sense. According to a National Marine Fisheries Service report, recreational fishing pumped nearly $2 million into the state's coastal economy between 1999 and 2000.

Continued

The Brunswick County Board of Commissioners recognize the economic value of the artificial reef program, McDowell points out. They put $10,000 into the county's annual budget to support Long Bay's reef program.

The Long Bay group raises funds and deploys reef material in alternating years. And, it rallies support when windfalls of donated material comes their way "out of cycle."

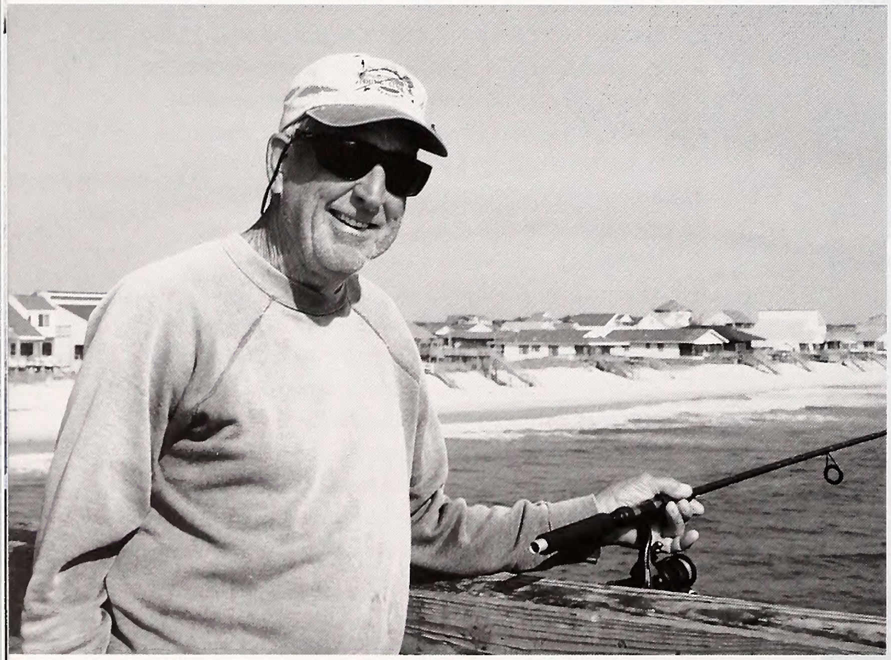
It was Long Bay that first introduced reef balls in North Carolina with the placement of 100 on four sites in 1998.

While the Long Bay-sponsored reef sites are productive, they are a long way from reaching their full potential, McDowell explains. Material covers only from 10 to 12 percent of each site.

McDowell is keen on using only environmentally safe material and doesn't hide his excitement about reef balls.

"They are engineered to last forever," he says. With 80 percent of the reefs balls' weight in their bottoms, they remain well-anchored to the ocean floor. Strong ocean currents pass through side and top holes without moving them or breaking them up.

Dale McDowell, president of the Long Bay Artificial Reef Association, says sport fishing has become an economic asset for Brunswick County since the reef enhancement program began.



Bob Whitworth, who has fished from the Long Beach Pier for 50 years, says fishing has never been better. About 65 reef balls were built into the post-Hurricane Floyd pier renovations.

"Do they work? I'm no scientist, but there are places where you couldn't catch a cold before. We're catching Atlantic spade fish, black sea bass and Spanish mackerel. Yes. They work," says McDowell.

BALANCING BENEFITS

But not everyone is advocating the buildup of artificial reefs. The jury still is out as far as the North Carolina Fisheries Association is concerned. The organization represents the state's commercial fishing industry.

In an article that appeared in the association's *Tradewinds* publication in December 2000, members expressed concerns about the long-term impact artificial reefs may have on commercial fishing in North Carolina.

Many members still remember the tire fiasco, and fear the use of reef balls may do even more harm to their nets and gear if not monitored and maintained adequately.

Ostensibly, the National Reef Plan seeks to enhance fish stocks and ultimately benefit commercial fishing. But NCFA members question whether artificial reefs have helped enhance fish populations. Still others feel recreational anglers are the big winners.

But the biggest worry is the prospect of added regulations to an already heavily regulated industry. Should artificial reef sites ever become "no-take" zones, it would seriously decrease the state's fishing area, the article says.

The group questions whether science supports assumptions about the benefits of artificial reefs.

Jerry Schill, NCFA president, served on the South Atlantic Fishery Management Council from 1989 until 1995. He says, "I have heard 'experts' questioning how much biological benefit artificial reefs offer. There are many in the environmental or biological arena that suggest artificial reefs offer no real production benefits, but rather only offer a place for fish to aggregate."

The worst-case scenario, he says, would be if future regulations make artificial reefs off-limits to commercial gear users — but open to recreational hook-and-line anglers. This would eliminate all benefits of the reef program to the commercial fishing industry.

Francesconi doesn't have immediate answers for the commercial fishing group or recreational anglers. DMF scientists are collecting data for a five-year, state and federally funded study. "Using hook-and-line fishing techniques, we are looking at species composition and relative productivity of reefs in shallow, mid- and deep ocean waters," he says. They also dive to conduct fish counts and to determine spawning activity.

Francesconi says they also have devised a material suitability index to compare ability to attract, stability, durability, cost, safety and ease of deployment.

Until all the results are in, he assures all sides of the issue that DMF is vigilant in its responsibility to monitor and maintain buoy and artificial reef sites using available high-tech equipment and diving observation.

DECISION TIME

Meanwhile, back at Berth 8, it's decision time.

Loading the reef balls has taken longer than anticipated. It's already past noon. The captain of the landing craft is getting an updated weather report. Wind is picking up off the southern coast. Francesconi decides to go with Plan B. The landing craft will move down the river and be in place to move out into the open ocean by 6 a.m. tomorrow.

But today won't be a wash.

We board the DMF *R/V Artificial Reef* with Francesconi, Craig Hardy and Chris Jensen, and head out to AR-372. Francesconi wants to sweep the ocean bottom. No material may be placed on live bottom. It's tedious work. Using side-scan sonar equipment, they slowly sweep the half-mile site making concentric circles around the buoy.

The yellow torpedo-shaped instrument, known as the "tow fish," is pulled behind the boat and emits waves to "see" what's on the bottom. Images are sent to a monitor on board — and stored on a file to evaluate later at the DMF labs in Morehead City.

Francesconi will be able to compare subsequent scanning images with baseline data to determine how reef material is functioning.

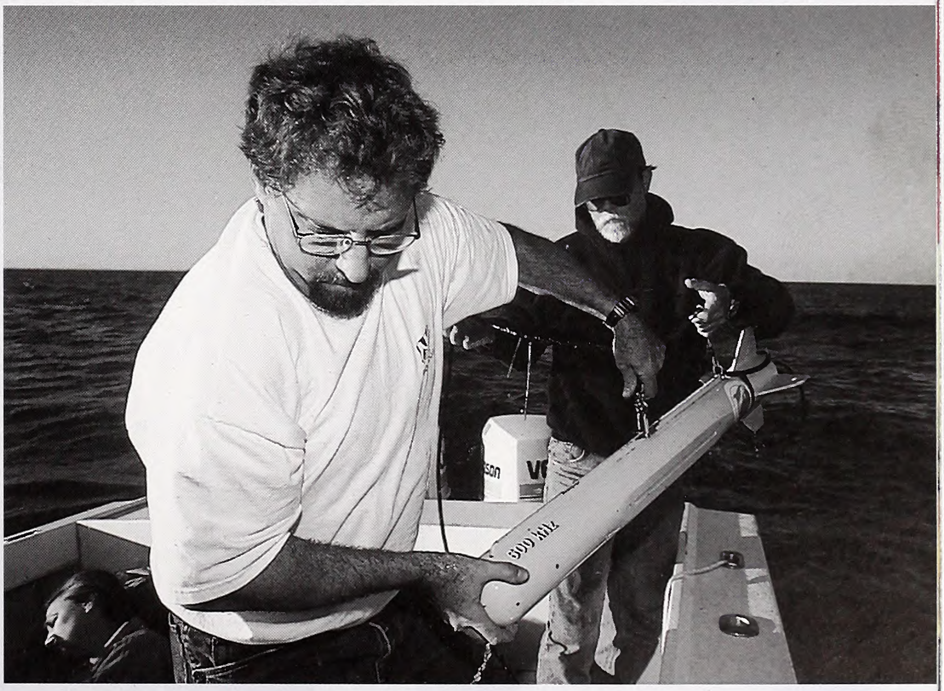
The wind and waves are building. Three hours pass. Francesconi is satisfied. The ocean floor beneath Buoy 372 is lifeless. Images confirm its geologic composition of sand over limestone. Tomorrow's deployment is a "go."

The team gathers at dawn for another nonstop day — minus the *Coastwatch* writer, who opts for land duty and a visit with Long Bay's Dale McDowell.

Five miles off shore, all goes according to plan. By mid-day, the Wrightsville Beach King Mackerel Tournament reef balls are in place in various quadrants of AR-372, much to the Merritts' delight.

The work is not over for the DMF crew. They'll complete nearby buoy maintenance and double back to the state port to begin preparations for the Long Bay deployment.

All in a day's work, Francesconi says.



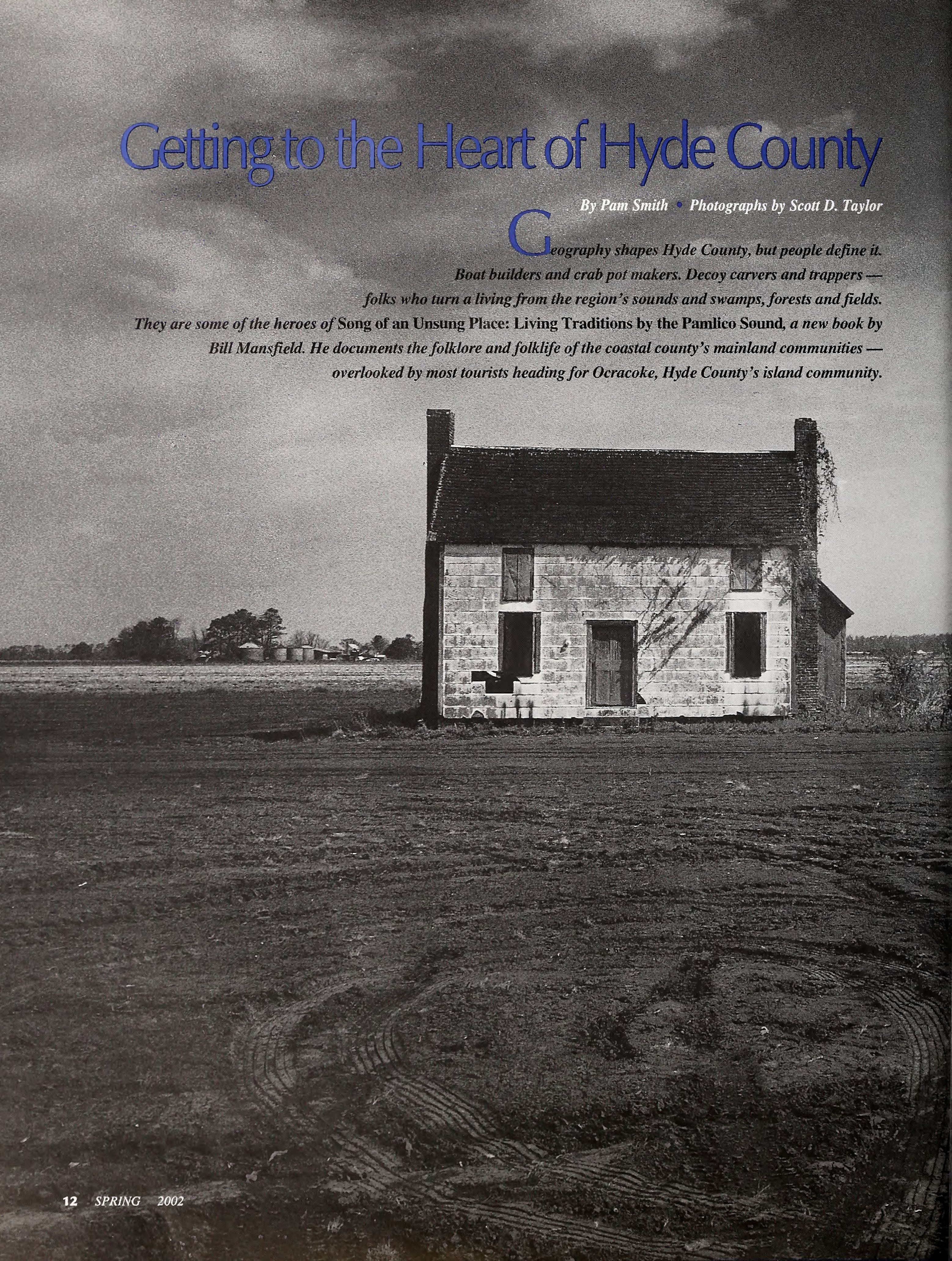
Scott D. Taylor

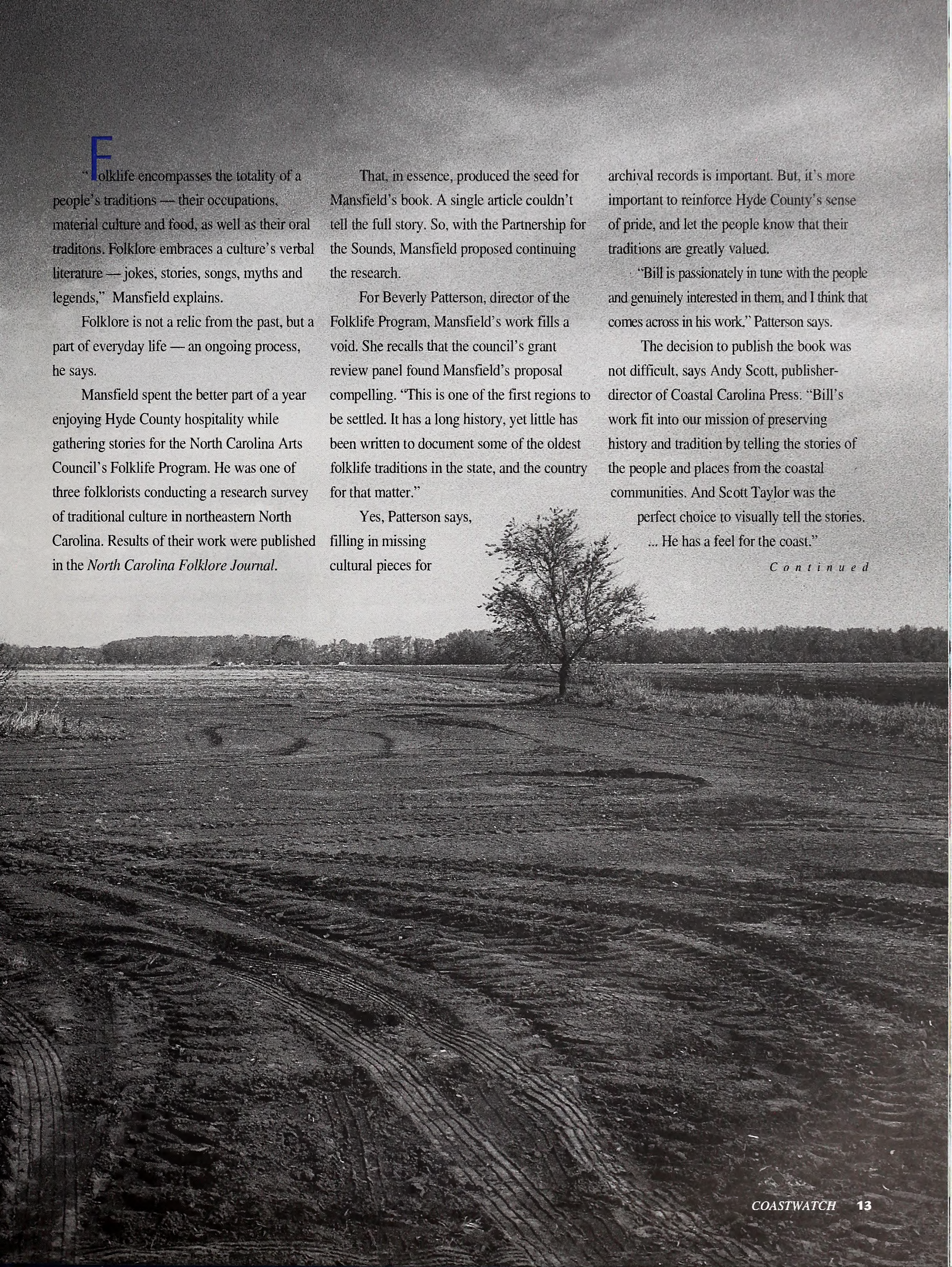
Jim Francesconi prepares to lower the 'tow fish' into waters off Wrightsville Beach. The side-scan sonar device will transmit a view of the ocean floor of AR-372.

Getting to the Heart of Hyde County

By Pam Smith • Photographs by Scott D. Taylor

Geography shapes Hyde County, but people define it. Boat builders and crab pot makers. Decoy carvers and trappers — folks who turn a living from the region's sounds and swamps, forests and fields. They are some of the heroes of Song of an Unsung Place: Living Traditions by the Pamlico Sound, *a new book by Bill Mansfield. He documents the folklore and folklife of the coastal county's mainland communities — overlooked by most tourists heading for Ocracoke, Hyde County's island community.*





"Folklife encompasses the totality of a people's traditions — their occupations, material culture and food, as well as their oral traditons. Folklore embraces a culture's verbal literature — jokes, stories, songs, myths and legends," Mansfield explains.

Folklore is not a relic from the past, but a part of everyday life — an ongoing process, he says.

Mansfield spent the better part of a year enjoying Hyde County hospitality while gathering stories for the North Carolina Arts Council's Folklife Program. He was one of three folklorists conducting a research survey of traditional culture in northeastern North Carolina. Results of their work were published in the *North Carolina Folklore Journal*.

That, in essence, produced the seed for Mansfield's book. A single article couldn't tell the full story. So, with the Partnership for the Sounds, Mansfield proposed continuing the research.

For Beverly Patterson, director of the Folklife Program, Mansfield's work fills a void. She recalls that the council's grant review panel found Mansfield's proposal compelling. "This is one of the first regions to be settled. It has a long history, yet little has been written to document some of the oldest folklife traditions in the state, and the country for that matter."

Yes, Patterson says, filling in missing cultural pieces for archival records is important. But, it's more important to reinforce Hyde County's sense of pride, and let the people know that their traditions are greatly valued.

"Bill is passionately in tune with the people and genuinely interested in them, and I think that comes across in his work," Patterson says.

The decision to publish the book was not difficult, says Andy Scott, publisher-director of Coastal Carolina Press. "Bill's work fit into our mission of preserving history and tradition by telling the stories of the people and places from the coastal communities. And Scott Taylor was the perfect choice to visually tell the stories. ... He has a feel for the coast."

Continued

The heroes of 'Song of an Unsung Place' include Dorothy Collins, left, who picks and cleans birds for hunters. She is pictured here with her sister, Lillian Spence. …

Passing on Traditions

The people of Hyde County made Mansfield's job easy. "They are friendly and generous. They fed me. They let me into their homes and opened their lives to me," he says.

"I wanted the book to represent the good people of Hyde County so when they read it, they will say, 'Yes, that's who I am.' "

He says his book is by no means a complete picture of Hyde County. "There are so many I didn't get to talk with. There's so much to know and understand," he says. He regrets that time and resources ran out before he could delve into the commercial fishing sector of the county.

He does, however, provide a glimpse into the maritime culture of the county that is wrapped by the Pamlico Sound and the Alligator and Pungo rivers.

Mansfield writes:

"Water regulates the geography and plays a profound role in shaping the region's traditions. While sounds and swamps insulate the natives from mainstream society, the water also provides them with three important maritime traditions: boat building, crabbing, and tying fishing nets. These keepers of traditions also adapt to new demands in order to compete in a keen market."

He introduces Robert Ross, one of Hyde County's remaining traditional wood boat builders.

"Born in Swan Quarter in 1934, he never relied exclusively on boat building to make a living. Like many people in Hyde County, he followed several occupations to make ends meet. Ross has operated a saw mill and a gristmill in partnership with his father. He has also repaired engines, crabbed, fished, trapped and worked as a carpenter building houses and hunting blinds."

Ross learned the skill from his father and older boat builders in the community.

Sadly, the market for wood boats was shrinking by the 1970s, and Ross was forced to retire from that occupation.

"When one way of making a living evaporated, Ross turned to another in order to stay at home," Mansfield says of Ross' resourcefulness — also a Hyde County tradition.

Take Percy Carawan, who learned to make decoys from his father. Carawan, who was born in 1910, tells Mansfield:

"My dad made decoys back there 'fore I was born. He made working decoys. He'd make a sleeping duck with his neck turned right around. Looked like his bill stuck in his down. My dad was a man that could do anything he wanted to do."

Like his father, Carawan carves decoys using a hatchet to shape the body. He uses roots from black gum to form the head and neck. No shortcuts.

Folk art collectors pay big money for decoys that look old, Mansfield tells him. Carawan turns the table and quips back: *"People want my decoys because of my age."*

The Next Generation

Scott Taylor has been photographing coastal North Carolina for more than two decades. Rapid changes in recent years gives him a sense of urgency about recording the coastal culture before it changes or is overwhelmed in some places.

That was one of his motivations for accepting the invitation to accompany Mansfield.

He was happy to see that many traditions are being kept alive by older residents. He is disturbed, though, to find "the lack of younger folks to carry on the traditions. I see older men fishing, for instance, often times without their sons or grandsons on the boat as it once was."

He adds, "I hear stories from these men about learning to work the waters from their grandfathers, yet I don't see their grandsons. That worries me."

Mansfield, too, is concerned about who will carry on the traditions. Figures from the 2000 census puts the Hyde County population at about 5,800 — about half of what it was in 1900.

"There has been no large migration of people here as there has been in other coastal counties," he says.

Margie Brooks, tourism director for the Greater Hyde County Chamber of Commerce, says that while the county is rich in natural resources, it is limited in tax revenues. Much of those prized natural areas are federal or state protected reserves. "That means that the county collects $55,000 in revenue for land with a tax value of $410 million."

She's asked Sea Grant to join with county commissioners, the Partnership for the Sounds and other local groups that are looking to spur economic development based on natural and cultural assets.

Geraldine Bush, who demonstrates the folding table used to build crab pots… And Marco Gibbs, who is one of the most skillful trappers in the county.

Jack Thigpen, Sea Grant extension director, says that supporting such initiatives in low-wealth coastal communities is one of Sea Grant's top priorities.

He points out that much of the groundwork in assessing Hyde County's cultural assets was done with Mansfield's folklife survey. Moving from the region's historical hunting and fishing traditions to heritage tourism is not a stretch.

"There is an overlap of interest. History and culture rank as top interests of those who come to North Carolina for nature programs," says Thigpen, who is a specialist in ecotourism. "Local people often take their traditions for granted and don't see their economic potential."

Plans are on the horizon to develop a Maritime Heritage Trail map that would guide visitors to historic places in the county.

One stop might be the newly renovated Octogon House in Englehard, says Jackie Peoples Woolard, executive director of the Partnership for the Sounds. "It's a unique place that is very close to the hearts of the people," she says.

Another "must see" place is the Lake Mattamuskeet Wildlife Refuge, Peoples says. "The architecture of the lodge is unique in itself, but it also represents a unique part of our history that typifies the Hyde County experience."

Brooks would like to see the lodge become a folklife center for the county and region. "Travelers are looking for that kind of experience," she says.

Sea Grant also is involved in a multistate study to determine the economic impact of the Intracoastal Waterway on local economies.

Though the waterway traverses the county, connecting the Alligator River with the Pungo River, there are no stopping-off places along its route. "We need to give people a reason to stop. Big boats mean big money," says Brooks.

Getting People's Attention

Mansfield's book, Brooks says, is a real shot in the arm for Hyde County. "We will get people's attention. It takes someone like Bill to record and preserve a way of life, culture and our history. Hopefully, it also will get our own young people's attention."

Brooks plans to put passages from the book on the chamber's Web site, and would like to see it used in the public schools so that young people will learn to appreciate their heritage. "There are so many great stories in the book," she says.

Mansfield says, "I loved hearing the stories. Some just cracked me up to hear the telling."

Bird hunting attracts hunters from all parts of the country to Hyde County and guides direct the lucky ones to local women who "pick and clean" the birds for a nominal price.

Mansfield says that Martin Amrstrong tells an amusing story concerning some men with an unusual method for dressing their geese:

"We had some hunters from Santee, South Carolina. There were eight of them, and they were a rough group. ... They killed their limit and I asked them what they wanted to do with their geese. ...

They didn't want their geese cleaned. After about three days I said, 'If you don't clean these geese, damn if they ain't going to rot.' The first one they had killed had done turned green! That's the way they were going to carry them home.

I said, 'What are you going to do with them damn rotten geese?' They said, 'We're going to eat them. We'll pack them in clay just like they are, then we'll cook them. We'll take them out, tear them open, and pick the meat right off them.'

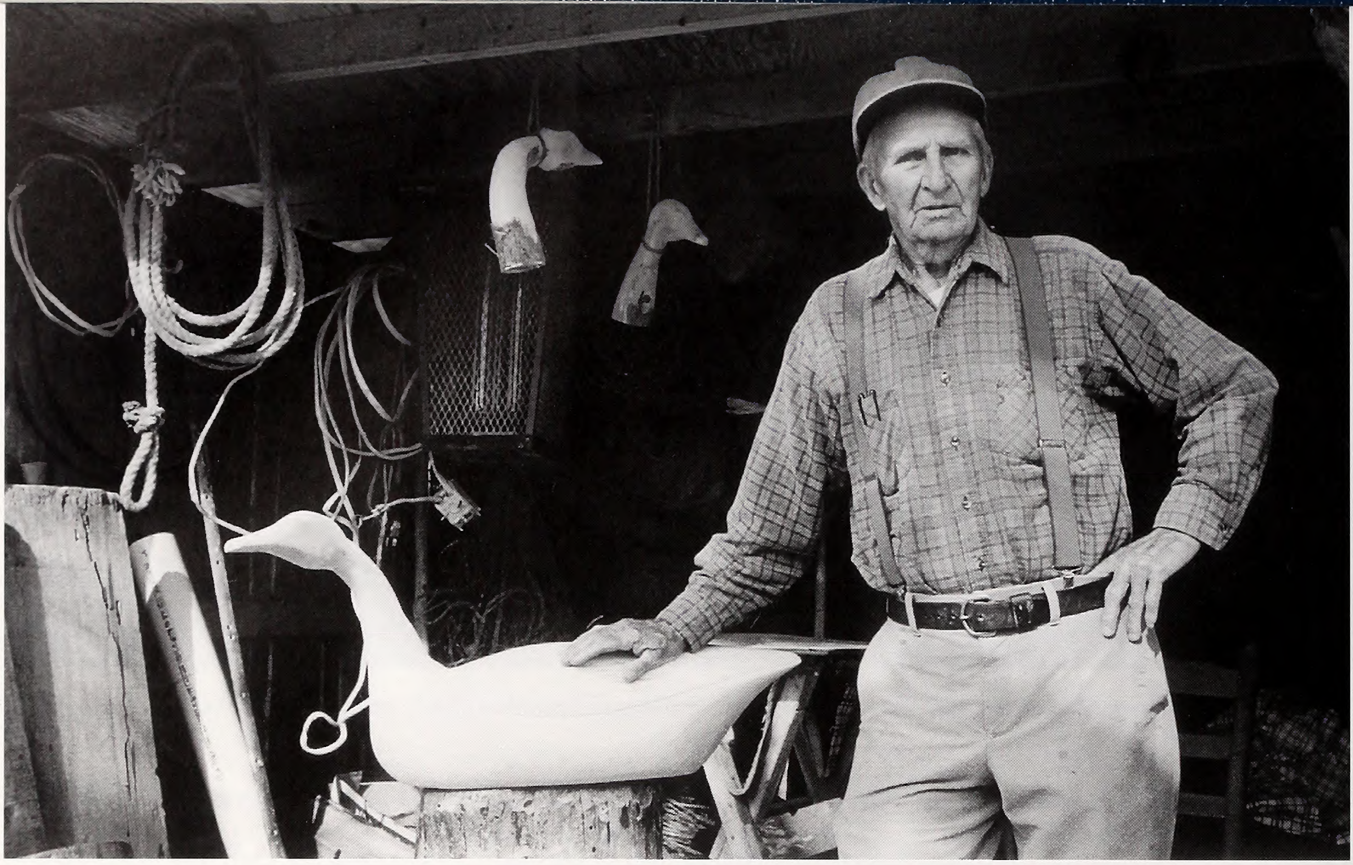
I said, 'Damn if it don't kill every damn one of you!' And it must have. I ain't seen one of them since. ..."

Does Mansfield have a favorite story? Without hesitation, he answers, "All of them. I feel privileged to have met and learned about their lives. I will take what they had to teach me and integrate it into doing a better job as a folklorist."

He is convinced that he has the best of all jobs. "It's so much fun, it's like getting paid to eat ice cream."

Mansfield currently is working in Atlanta with National Park Service Cultural Resources. He is documenting the oral history of the famed Tuskeegee Airmen. Interviews include all personnel from fighter or bomber squadrons, including pilots, navigators, instructors, clerks and parachute packers.

Photos from the book are used with permission from Coastal Carolina Press. For more about Song of an Unsung Place, *go to* www.coastalcarolina press.com. *Or visit your local bookstore.*



Percy Carawan carves decoys with a hatchet — just as his father taught him.

Listen Up, Hyde County

For a decade, North Carolina State University sociolinguist Walt Wolfram has been studying an important aspect of Hyde County culture — its distinctive "hoi toide" dialect.

In a book released recently, Wolfram and co-author Erik Thomas show that African American speech is derived from British-based dialects and an African American Creole language. They base their findings on studies of 150 taped interviews with African American and white residents of the coastal county.

"Limited in-migration and population growth, along with the relatively stable co-existence of white and black families, make Hyde County an ideal laboratory," Wolfram says.

"Listening to older African Americans in Hyde County can tell you what black speech was like; listening to young African Americans can tell you where it is going," he asserts.

Wolfram explains that one African American octogenarian's speech is much like that of an older white "hoi toider." However, the linguist discerns the vestiges of Creole African patterns *not* used in white speech.

"Young African Americans from Hyde County no longer sound like 'Hoide' folks. Instead, they have adopted the national norm of African American speech," Wolfram says.

Today, 97-year-old Muzel Bryant is the only African American resident of Ocracoke Island. For generations her family lived in an otherwise all-white culture. Yet, Wolfram says, her dialect is not purely "O'coker."

"The answer must be that the Bryant family arrived on the island with black speech. In its isolation, the Bryant family became its own speech community. The nine children in the Bryant family perpetuated African vestiges of speech," Wolfram concludes.

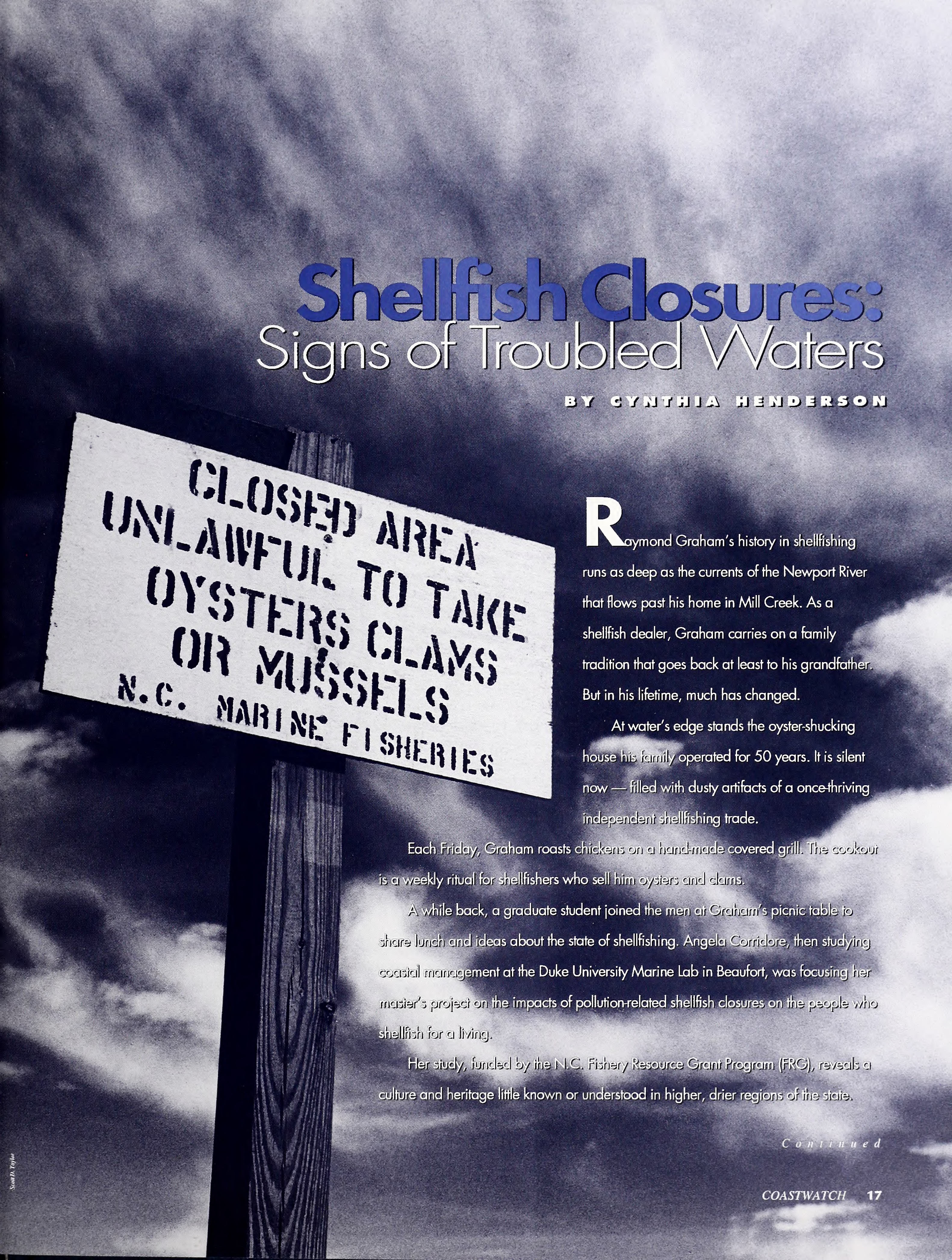
Wolfram and Thomas' research was supported by the National Science Foundation and the William C. Friday Endowment. The book, *The Development of African-American English,* is published by Blackwell Publishing Co. ◘

Walt Wolfram is William C. Friday Distinguished Professor of English, and Erik Thomas is an associate professor of English, both at NC State.

ABOVE: *Today, 97-year-old Muzel Bryant is the only African American resident of Ocracoke Island.*

Shellfish Closures:
Signs of Troubled Waters

BY CYNTHIA HENDERSON



Scott D. Taylor

Raymond Graham's history in shellfishing runs as deep as the currents of the Newport River that flows past his home in Mill Creek. As a shellfish dealer, Graham carries on a family tradition that goes back at least to his grandfather. But in his lifetime, much has changed.

At water's edge stands the oyster-shucking house his family operated for 50 years. It is silent now — filled with dusty artifacts of a once-thriving independent shellfishing trade.

Each Friday, Graham roasts chickens on a hand-made covered grill. The cookout is a weekly ritual for shellfishers who sell him oysters and clams.

A while back, a graduate student joined the men at Graham's picnic table to share lunch and ideas about the state of shellfishing. Angela Corridore, then studying coastal management at the Duke University Marine Lab in Beaufort, was focusing her master's project on the impacts of pollution-related shellfish closures on the people who shellfish for a living.

Her study, funded by the N.C. Fishery Resource Grant Program (FRG), reveals a culture and heritage little known or understood in higher, drier regions of the state.

Continued

Certain areas of water are closed to shellfishing temporarily when the potential for pollution is great, as when a certain amount of rain falls within 24 hours.

"If water doesn't meet the standards for its intended use," Corridore says, "it violates the Clean Water Act," a 1977 amendment to the Federal Water Pollution Control Act of 1972. Because the Newport River was once a productive shellfishing area, being closed to shellfishing means it is not meeting clean water standards.

Mike Marshall, central district manager of the N.C. Division of Marine Fisheries (DMF), says that closures generally have followed coastal development.

"The most recent fairly large-scale closures have been around the Pamlico Sound. More closures have been in the southern areas in the past," he says.

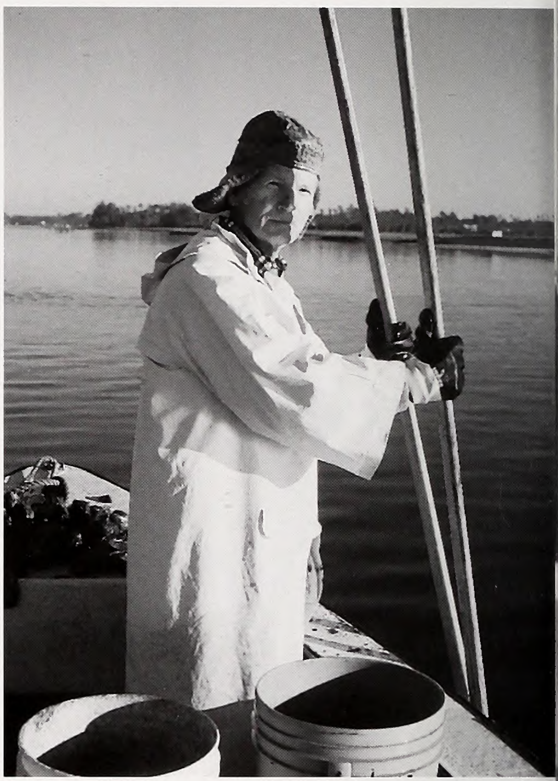
Development decreases the permeable land surfaces that absorb and filter rainwater. Without such filtering, runoff from storms carries microorganisms from human and animal waste — collectively known as fecal coliform bacteria — into waterways. These bacteria and certain viruses are associated with illnesses like typhoid, cholera, gastroenteritis, salmonella and hepatitis A, according to Corridore.

Shellfish closures, therefore, are environmental actions intended to protect public health. But Corridore sees social implications as well.

"Environmental issues aren't affecting just the environment itself, but people," she says. "The human component gets ignored."

As part of her FRG project, Corridore used a survey and personal interviews to discover how shellfish closures affect people who work on the water. FRG, which provides funding for research carried out by those involved in coastal or seafood-related industries, also funds projects such as Corridore's that include significant participation from the fishing community.

For Corridore, the project was more than an academic exercise. Unsatisfied with a superficial understanding, she went out with shellfisher Charlie Antwine to experience tonging for oysters herself. "It was hard work," she says emphatically.



Cynthia Henderson

Scott D. Taylor

TOP: Charlie Antwine tongs for oysters in Core Creek. BOTTOM: Many oysters served in restaurants and at seafood festivals in North Carolina are now from out-of-state.

THE ISSUES

The men around Raymond Graham's picnic table are as likely to talk about temporary shellfish openings as closures. So common are closures, Graham says, that shellfishing is no longer a dependable way to make a living.

"Most people working here now are retired," he says. "Anybody with a family can't make a living out there. They have to do something besides shellfishing."

In addition to limited accessibility to shellfish waters, shellfishers have seen a dramatic decline in oyster populations. Parasitic diseases like Dermo, which became a problem in the late 1980s, and MSX have contributed to this decline. And then there were detrimental effects from hurricanes in recent years.

As Graham puts it, "Hell, we've been hit by everything but leprosy."

Antwine, who shellfishes part time, is retired from the N.C. Department of Transportation. He sees pollution as a major problem but questions the standards used to determine closures. "We can sell oysters from Mississippi, but ours can't be bought. We don't want to make people sick. We want to provide a product people will eat," he says.

Graham's son, Raymond Jr., agrees. He also shellfishes only part time. In addition to bacterial pollution, he blames household chemicals like chlorine and discharges from nearby municipalities for problems with shellfishing. "Twenty-five years ago, we didn't have the chemicals like we do today," he says.

Cam McNutt of the N.C. Division of Water Quality in Raleigh says that point sources such as municipal discharges are actually becoming "less and less of a problem."

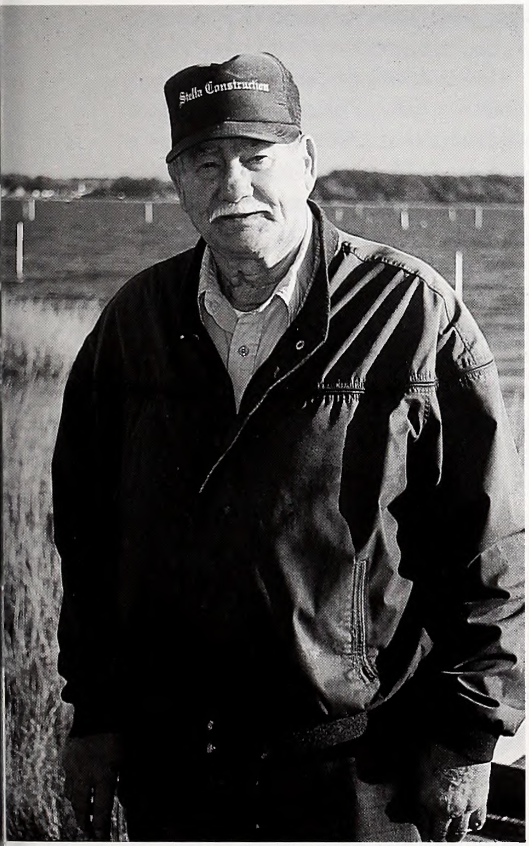
"We removed a discharge source out of the New River from Jacksonville and Camp LeJeune in 1998, consolidating its discharges into one high-quality treatment facility" he says. "The water quality there has recovered substantially since then."

However, he says, "Stormwater runoff is becoming more and more of a problem. It's not one thing that causes water quality problems. It's usually multiple things."

"Standards for SA (shellfishing) waters are some of the most stringent of all classifications," says McNutt. Water for swimming, for example, can have bacterial counts of 200 colonies per 100 ml of water. For shellfishing, the limit is 14 colonies. The reason for the higher standards, he explains, is that shellfish concentrate the bacteria.

CLOSED AREA
UNLAWFUL TO TAKE OYSTERS, CLAMS, OR MUSSELS. SHELLFISH MAY CAUSE SERIOUS ILLNESS IF EATEN.
NC MARINE FISHERIES

Cynthia Henderson



Cynthia Henderson

TOP: Angela Corridore at a shellfish closure near the Duke Marine Lab in Beaufort. Her master's study brought attention to the impacts of such closures on those who make an income fishing for oysters and clams. BOTTOM: Raymond Graham, a shellfish dealer from Mill Creek, sees the link to his family's heritage wearing thin as closures threaten the livelihoods of younger shellfishers.

THE WAY IT WAS — AND IS

Raymond Graham, a former member of an advisory committee for the N.C. Marine Fisheries Commission, focuses on the present but doesn't forget the past. It's a trait that is evident in his speech. "And that's the way it is," is his frequent summation of things.

And "the way it is" is very much a product of how it was.

The first dollar Graham ever made, he says, was culling 20 bushels of oysters one Saturday when he was around nine. Before that, the most he had earned was 75 cents for a whole week "working in beans," so the dollar earned in a single day made an impression. He may not remember what he did with the money, but Graham does recall, "I looked at it a long time."

Graham also shoveled oysters for his father, he says. On Saturdays he would get 25 cents for movies and popcorn. John Wayne was a favorite.

"Everybody went to Beaufort by boat, and tied up at the hardware store," he says, recalling Beaufort as a working fishing village. "Fruits and vegetables were left out all night (by merchants), and the town smelled like a fish. All of Front Street is now a tourist attraction."

These days, when waters are closed to shellfishing, Graham's love of movies serves him well. "Shutdowns are just another Sunday," he says with irony. "You sit down, eat and watch some movies."

"Where closures hurt us," he explains, "is not being able to consistently fill orders. We used to handle eight or nine hundred bushels a week. Now if a man wants 10 bushels of oysters, we can't promise we can get 10 bushels, because we can't be sure we'll be open. We lost our credibility."

In its heyday, Graham's business included Campbell's Soup in Maryland. Back then, he could handle more clams in a week than he does now in a month.

The business was a family legacy. "When Granddaddy got old, he worked for Daddy. And when Daddy got old, he worked for me," Graham says.

"Mother opened oysters and took care of the oyster house. Mom was in her 70s before she quit."

Now, with the oyster house closed and shellfishing providing only part of his son's income, the generational link to shellfishing is wearing thin. "A young fellow would have to be out of his mind to want to get into this business," Graham says.

Because few depend solely on shellfishing for a living, the economic impact of closures could be considered small, Corridore says. "The social impact, however, may be quite large because, as fewer people are able to rely on shellfishing for a living, there may be a gradual loss of a local cultural heritage," she concludes.

And the culture of shellfishing is doubtless a part of the melange that is the state's collective identity.

DMF's Marshall recalls his father bringing oysters from the coast home to Rocky Mount for oyster roasts each fall. "It was comparable to a pig picking," he says. "It used to be a big social event. It's sad that we're losing that as a social activity here on the coast."

Now, at Mill Creek's annual oyster festival, the oysters come from Louisiana.

"I'm not doing 25 percent of the business I did 10 years ago. When I do, I have to compete with oysters from Louisiana," Graham says.

Skip Kemp, North Carolina Sea Grant mariculture specialist, says, "Shellfish closures also affect shellfish farms, especially if a closure is immediately before a holiday when the market is strong."

Mariculturists who lease beds may hold onto shellfish until demand is strong and prices are higher, Kemp adds. Thus they miss out on potential profits when closures occur during peak demand.

Continued

REGULATING SHELLFISH WATERS

Corridore's analysis examines the roles of various agencies. The U.S. Environmental Protection Agency administers the Clean Water Act and requires states to develop a Nonpoint Source Management Program (NPSMP). Shellfish management then becomes an alphabet soup of agencies.

To simplify, managing shellfishing waters involves three arenas — public health, the environment and coastal development. To ensure public health, the Shellfish Sanitation Section of the N.C. Division of Environmental Health (DEH) classifies and tests shellfishing waters. It makes recommendations to the DMF, which issues proclamations and enforces closures.

The N.C. Coastal Resources Commission (CRC) designates Areas of Environmental Concern and establishes regulations to control development. The state's Division of Coastal Management (DCM) implements the regulations and issues permits for development within the sensitive areas.

One way the CRC protects shellfishing waters is by requiring a 30-foot buffer zone for building along estuarine shorelines.

Dave Beresoff, a commercial fishing representative on the commission, cites a move last fall to protect shellfishing waters even while compromising with builders to allow isolated exceptions to the buffer rule.

"We initiated an exception to the exception. If the commission makes exceptions to the rules, they should never apply to shellfishing waters," he says.

The N.C. Division of Water Quality (DWQ) coordinates the NPSMP and water quality regulations of the Clean Water Act. Corridore points to a lack of coordination between agencies in the past.

Fortunately, McNutt says, a project is underway to help interagency communication through a shared database. "It's a multi-user approach," he says. "It will include information from DEH and will be used heavily by DWQ and Marine Fisheries."

Gloria Putnam, the state's coastal nonpoint source program coordinator, says the program is providing funds for high-tech equipment to allow state agencies to map the closure lines. "That information will be entered into the database, along with DEH water quality monitoring data," she says.

The data will allow the tracking of trends along the coast — and will provide local government and state agencies with information needed to target water quality restoration and protection efforts. "It's a way to bring us together with information in a more usable format," Putnam adds. "This will help us. It's not a panacea, but we're moving in the right direction."

"One of the things that may eventually be a useful outcome," she says, "is having information available online so anyone can see what areas are open or closed."

And, of course, there is the goal of improving shellfish habitats and increasing harvests. As Putnam says, "I love oysters. And when I get them, I want N.C. oysters. They're just better oysters because they're not so big — they're fresh and they're salty."

TONGING FOR OYSTERS

At daybreak on the Newport River, within sight of Graham's vacant oyster-shucking house, Charlie Antwine sets out by boat to tong for oysters.

As he motors toward Core Creek, the purple sky goes white with mist, creating a dreamscape in which sky and water are nearly indistinguishable. The motor drowns all other sounds, and cold numbs the face. Ahead of the boat, a dolphin materializes, arches upward in a slow turn, then disappears.

When Antwine cuts the motor, he says it is rare to see dolphins in the cooler months.

He demonstrates using oyster tongs, which are two long poles joined scissors-fashion with opposing, elongated rakes at the end. He thrusts the tongs down to the hard shell substrate, then brings the wide-apart handles together, which closes the rakes under the water. Hoisting the closed tongs up, he examines the caged contents.

Sometimes the catch is empty shells — sometimes, a single oyster or small cluster of them, or a clam or two. Antwine gauges the size of the shellfish, throwing back those under the size limit. If Nautilus of Greek mythology had been a shellfisher, it would be clear how the exercise equipment got its name. It is, as Corridore says, hard work.

Soon, the sun blazes to orange and work continues as outer layers of clothing are shed. Other shellfishers arrive nearby. Some also are tonging from boats. Others are in wet suits — waist deep in water harvesting oysters by hand.

For the most part, the work is solitary, though some pleasantries are exchanged about what kind of luck each is having or where a closed area was recently opened.

When the catch becomes mainly empty shells, Antwine motors to a new spot and begins again.

Before heading back to Graham's with his harvest, Antwine gives a tour of other shellfishing areas. Out toward the bridge that connects Morehead City to Beaufort, he goes into a creek. The water appears pristine, but the area is closed temporarily.

Unlike permanent closures, where signs warn that shellfishing is prohibited, temporary closures have no signs. Thus, should a shellfisher not know an area is closed, an entire day's work might have to be discarded, according to Corridore. All shellfish catches have to be tagged to verify origin.

Continuing the tour, Antwine points to Cross Rock. "You used to get good oysters there, but now it's dead," he says. Oyster rocks can die at a certain age, he explains, or they can die from disease.

"Oysters don't have the resistance they used to, because of pollution," Antwine says.

Corridore's final report, according to Trish Murphy of the DMF, may be considered in the development of the next fishery management plan for hard clams and oysters.

For Beresoff, future management has a singular importance. "We've done too much too quickly and not seen the consequences down the road," he says. "Now we have to protect what's left." ◘

Angela Corridore is now a Knauss Fellow with the U.S. Commission on Ocean Policy, in Washington, D.C.

Hope Plantation: Explore Historic Treasure

By Ann Green

Inside a large kitchen at Hope Plantation near Windsor, a massive brick fireplace covers almost one entire wall.

"The fireplace is so large that five adults can stand in it," says LuAnn Joyner, administrator of Historic Hope Foundation, Inc.

During the antebellum period, servants toiled in the kitchen, preparing elaborate meals for then North Carolina Gov. David Stone, who served the state from 1808 to 1810.

One would watch the set kettle that kept water hot all day. Others would tend to ginger cookies and other goodies in the bake oven or prepare stews and soups.

"The kitchen is one of the most accurately reconstructed kitchens anywhere," says Reid Thomas, historic and preservation restoration specialist with the State Historic Preservation Office in Greenville. "There is a dresser — long board like a countertop where the workers prepared most of the meals."

Another special architectural feature is the open ceiling that allowed smoke to vent through the building, adds Thomas.

The newly restored kitchen, which is in a separate building near Stone's elaborate home, is just one part of Hope Plantation that also includes two historic homes and a reception center. The largest and most elegantly furnished is Stone's mansion that was completed around 1803.

Visitors are introduced to the historic site at the Roanoke-Chowan Heritage Center located in a new building at Hope Plantation.

One room is filled with exhibits on the Hope restoration and Stone — who served as governor, U.S. representative and senator, and North Carolina superior court judge — as well as books from Stone's 1,400-volume library, one of the largest in the state. Another room showcases dozens of Louis Orr's black and white prints of North Carolina. There is also a theater where you can see a short film on the plantation.

HOPE MANSION DINING PARLOR.

Courtesy of the Historic Hope Foundation

"Hope Plantation has an incredibly rich history," says Joyner. "Gov. Stone was remarkable, particularly in the field of education. Stone was a member of the board of trustees of the University of North Carolina, and he was one of five men who served on the committee to select Chapel Hill as the site for the university."

The plantation offers insights into the late 18th- and early 19th-century agrarian and rural life in Bertie County.

During Stone's ownership, the plantation — which was spread over more than 5,000 acres — was planted with a variety of crops, including cotton, tobacco and peanuts.

"Hope Plantation has been a tremendous asset to Bertie County," says North Carolina State University professor Turner Sutton, who grew up in the county. "The restoration of Hope and the continued growth of Hope Plantation is a remarkable achievement for a poor county such as Bertie and an excellent example of what can be done if people from all walks of life are truly committed to a project."

Tourism that focuses on the rich history and culture of the region is important for local people and visitors, says Jack Thigpen, North Carolina Sea Grant extension director and coastal and tourism specialist. "Research with ecotourists has shown that there is a strong interest from birders and other nature tourists in the region's history and culture," he adds.

18th-Century Home

Visitors also get a glimpse into 18th-century life at the King-Bazemore House, which was built in 1763. The house is now "one of only two houses in North Carolina with a gambrel or barn-style roof and brick-end walls," according to the foundation.

The old home — which was moved to the site from four miles west — opened to the public in 1986, says tour guide Betty Constable. "The Bazemore heirs gave it to the Hope Foundation," adds Constable.

Inside the house, all woodwork is original.

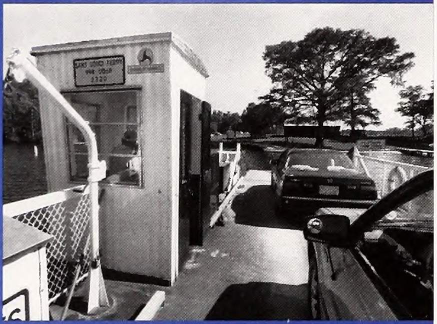
The furniture and knickknacks reflect the simple lifestyle in 18th-century Bertie County.

In a downstairs room used for entertaining, a reed light adorns a Georgian-style mantelpiece. "They burned reed instead of candles to save money," says Constable.

Upstairs, the children's bedroom is outfitted with rope beds. "You have heard the phrase, 'sleep tight and don't let the bedbugs bite,' " says Constable. "They tightened the ropes to secure the bed and make it comfortable. To keep the bedbugs out, they washed and cleaned the mattresses."

Continued

Courtesy of the Historic Hope Foundation



Courtesy of the News & Observer

TOP: *The Hope mansion, built in 1803, is mostly Georgian in style with Federal influences.*

BOTTOM: *The Sans Souci ferry crosses the Cashie River in Bertie County.*

CHARMING TWO-CAR FERRY

As you wind down Secondary Road 1500 in Bertie County on the edge of the Cashie River, there is thick vegetation and a sign: "Blow Horn for Ferry."

After tooting the car horn, a small ferry pulls off from the opposite bank.

Within less than five minutes, the Sans Souci ferry — one of only three river ferries operated by the N.C. Department of Transportation (NCDOT) in North Carolina — has reached the other side. The other two-car ferries run across Meherrin River in Hertford County and the Cape Fear River in Bladen County.

The ride takes you to the other side of the river where there is an abundance of fields and farm land.

"You get a great view of the black river," says Eldridge Baker, one of the NCDOT workers who captains the ferry.

For more information, call the NCDOT District 2 Office at 252/332-4021. —A.G.

As you walk out of the back of the house onto the porch, there is a guest bedroom with an outside entrance. "There were no motels or hotels then," says Constable. "When people were traveling, they would knock on the nearest door and ask to spend the night. A lot of homes had a stranger's or traveler's bedroom."

In the backyard, there is a meat storage or smoke house that is simply furnished with three tables, a small oven and kitchen utensils.

"The original kitchen burned, so we rebuilt it," says Constable.

Stone's Palatial Home

The highlight of the plantation is Stone's elaborate home, which he patterned after the popular 18th-century book: Abraham Swann's *The British Architect*. Built on an above-ground basement, the house has a basic Palladian design with some neoclassical features and a hipped roof topped with a "widow's walk."

"This home is an outstanding example of Georgian architecture in the late 18th century," says Thomas. "The craftsmanship, design and construction were superb. A large percent of the people involved in the construction were free blacks and slaves."

As you enter the mansion, there is a long center hallway with a huge archway and elaborately painted floor cloths. "David Stone lived here until he died in 1818," says tour guide Evelyn Parker. "Then his daughter lived here until 1833."

The house was vacant for many years until the Historic Hope Plantation Foundation began restoration in the 1960s, Parker adds.

Each room, including the dining room, is elaborately furnished with period pieces, many from Roanoke River cabinetmakers. One of the most handsome dining room pieces is a walnut and pine cupboard enscribed with the initials "W.H.," who was thought to be a local cabinetmaker.

"The home has one of the finest collections of Southern furniture, primarily from North Carolina cabinetmakers," says Thomas.

On the first floor, there is also a beautiful family parlor that was used for entertaining Stone's family and numerous guests.

On the other side of the hallway, the master bedroom gives a glimpse into the role of a plantation owner's wife. A traveling silk sash lies on an antique chest of drawers. Nearby is an apothecary chest.

"The lady of the house made the medicine," says Parker. "She used mostly herbs."

The second level of the house has bedrooms as well as rooms for entertaining. As you go up the steep stairs, there is a handsome drawing room with a piano and backgammon table.

"David Stone's wedding to his second wife took place here," says Parker. "When they had a special event, they placed the furniture against the wall."

Near the ballroom is a library furnished with globes, overhead projector, bronze telescope and bookcases.

"Stone wrote a note to his wife on the back wall of the bookcase," says Parker.

On the opposite side of the hallway, a boy's bedroom is furnished with a red chest, single bed with canopy and drum used in the War of 1812. "Of Stone's 11 children, six died," as youngsters, says Parker.

Like many plantation homes, the home had separate servant stairs that ran from the basement to the attic.

In the basement, the servants likely ate in the warming kitchen, according to Parker.

Historians are continuing to uncover important information about Hope Plantation.

Through a N.C. Department of Transportation grant, the foundation began excavation in December on Old Halifax Road, which runs in front of the plantation.

"We hope to find the old slaves quarters," says Joyner. "Several artifacts have been found already that seem to indicate a slave cabin that stood to the southwest of the Hope mansion."

With the project's completion, visitors can get another perspective on rural life in Bertie County.

"This phase of the project will educate the public about the history of the important people who raised the crops and animals to sustain this lifestyle," adds Thigpen. ▪

Hope Plantation is four miles west of Windsor on Hwy. 308. The plantation is open Jan. 3-Dec. 20, Monday-Saturday 10 a.m. to 4 p.m., Sunday 2 to 5 p.m. For more information, call 252/794-3140.

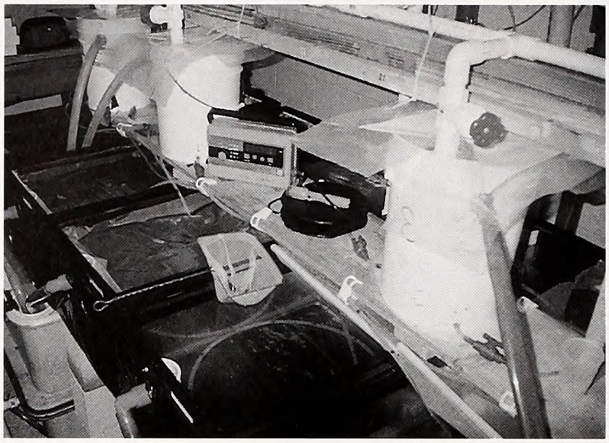
New Research Projects Reflect Sea Grant Spectrum

By Katie Mosher

Biologists Bobby Clark, left, and Michael Hopper have worked on Sea Grant projects at the Pamlico Aquaculture Field Laboratory.

Continued

This spring, North Carolina Sea Grant researchers will begin a new round of projects, each aimed at a particular aspect of our coast and its vast resources.


Jim Rice

In the next year, Sea Grant will spend more than $1 million on research. Nearly $770,000 will be awarded for 17 projects at five campuses in the University of North Carolina System. And $300,000 will support graduate students working on the projects.

"Each project meets an identified need in our state," explains North Carolina Sea Grant Director Ronald G. Hodson. "We anticipate scientific results that will have direct impact on coastal issues."

Such direct impacts have been the hallmark of Sea Grant's "applied research" projects since the program first funded studies in North Carolina more than 30 years ago.

Sea Grant results are shared with researchers around the country and the world, and with state agencies, community groups, business leaders and others who must make tough decisions regarding coastal resources.

The scientists are not alone in efforts to share the results. Sea Grant extension specialists and communicators link university researchers and the public, during the data gathering process and when final results are available.

"Our Sea Grant staff members can translate the technical research techniques — and often complicated results — into terms that the public can understand," Hodson says.

While the science of each new project may be targeted, the research is within the context of important overall questions, such as:

- Can we find better ways to assess the quality of North Carolina's coastal waters? And how does water quality affect the stocks of fish that have crucial nursery grounds in our sounds and estuaries?
- How can we ensure seafood is safe to eat?
- How can we improve aquaculture techniques and procedures to provide a sounder economic return?
- How is our coastal population changing? What groups are moving to our coast?
- How can coastal science topics be included in more classroom lessons?

The projects are selected through a stringent review process. Last spring, researchers across the state were invited to submit "preproposals," which were reviewed by an in-state committee that looked at the particular relevance and need in North Carolina.

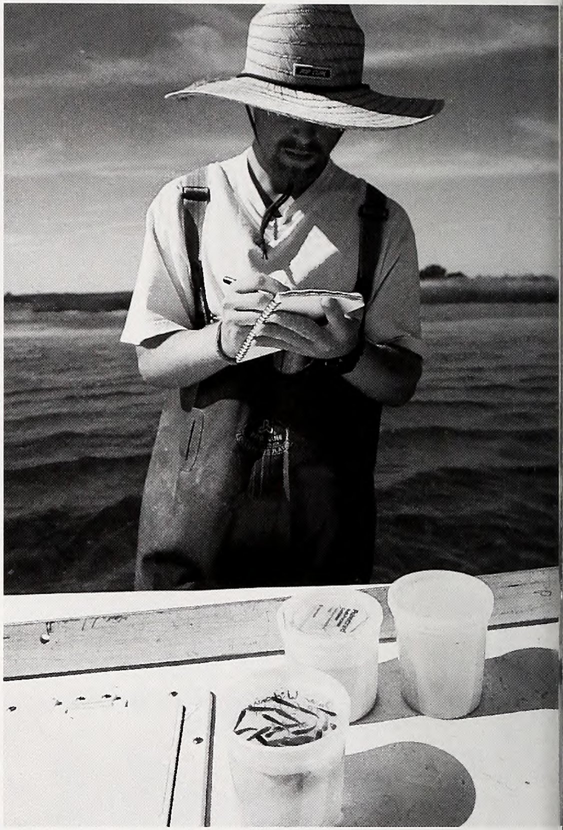
Based on comments from the task force, the researchers developed "full proposals." Sea Grant then sent those proposals to out-of-state peer reviewers who are experts in specific fields. Those reviews — which evaluated scientific hypotheses, research techniques, etc. — were considered in the final review process by an out-of-state review team of expert scientists and managers.

Of the 32 full proposals submitted last year, 17 were selected, reflecting a spectrum of coastal issues. Organized into broad topic areas, they are:

Fisheries

• **"Hypoxia and Estuarine Nursery Habitat Quality: An Experimental and Modeling Approach Linking Low Dissolved Oxygen with Fish Survival and Growth,"** by Jim Rice of NC State University, in collaboration with Sea Grant researchers from Delaware and Louisiana. (This project started in the 2000-2002 cycle and will continue for one more year.)

• **"Impact of Striped Bass Predation on Young-of-the-Year River Herring in the Albemarle Sound Estuary,"** by Jeffrey A. Buckel and Joseph E. Hightower, both of NC State. (Hightower also serves as the assistant leader of the N.C. Cooperative Fish and Wildlife Research Unit.)

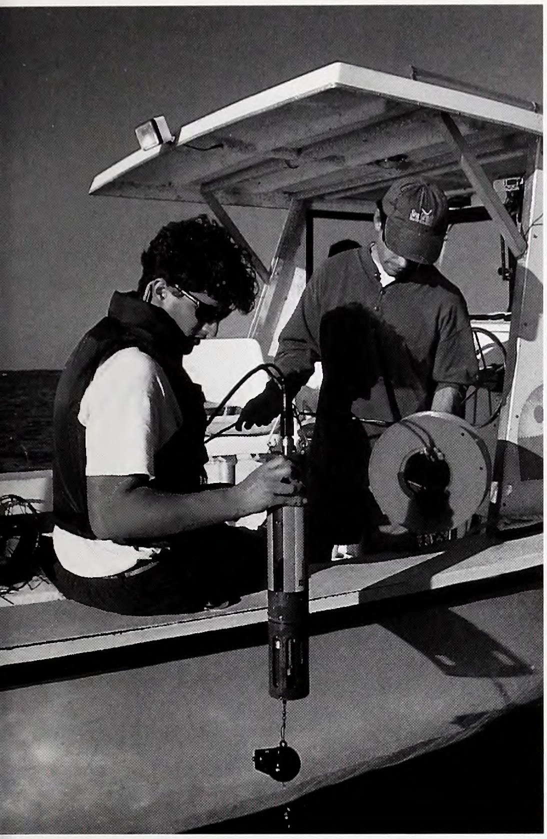

Scott D. Taylor

Many North Carolina Sea Grant research projects focus on estuarine ecosystems and habitats. Some projects result in models based on laboratory experiments on hypoxic conditions (left). Other research focuses on data gathered in the field (right).

• **"Broken Rungs at the Bottom of the Ladder: Effects of Stratification-Induced Hypoxia on Trophic Transfer Between Plankton and Grazers in a Shallow Eutrophying Estuary,"** by Peter S. Rand of NC State.

Aquaculture

• **"Reproduction of Domesticated Striped Bass: Coldbanking to Arrest Maturation and Atresia,"** by Craig V. Sullivan, NC State. (This project started in the 2000-2002 cycle and will continue for one more year.)



Scott D. Taylor

Herman Lankford

Traditional Sea Grant fields of research now employ high-tech equipment. Scientists test hypotheses in fisheries (left) and seafood technology (right). Commercial and recreational fishing, as well as seafood processing are crucial elements in the coastal economy.

- **"Accelerated Genetic Improvement of Striped Bass: Molecular Biomarkers of Growth Performance,"** by Russell J. Borski and Craig V. Sullivan, both of NC State. (This project will start in 2003.)
- **"Characterization of Novel Peptide Antibiotics from Hybrid Striped Bass,"** by Edward J. Noga of NC State.
- **"Aquaculture of Southern Flounder: Improved Fingerling Production and Development of Growout Technology,"** by Harry V. Daniels of NC State and Wade O. Watanabe of UNC-Wilmington.

Seafood Technology

- **"Alkaline-Aided Processing to Upgrade Value of Southeastern Pelagic and Demersal Species: Croaker *(Micropogan undulatus)* and Menhaden *(Brevoortia tyrannus, patronus)*,"** by Tyre C. Lanier of NC State.
- **"Characterizing the Stress Response of *Vibrio vulnificus* to Sublethal Stresses During Oyster Handling and Processing,"** by MaryAnne Drake, David P. Green and Lee-Ann Jaykus, all of NC State.
- **"The Viable But Nonculturable State in Human Bacterial Pathogens in Eastern North Carolina Waters,"** by James D. Oliver of UNC-Charlotte.

Coastal Policy

- **"Stakeholder Perceptions of Water Quality: New Approaches to Assessing and Responding to Public Involvement,"** by David Griffith and Jeffrey C. Johnson of East Carolina University.
- **"Demographic Change in North Carolina's Coastal Counties and Related Policy Implications,"** by Lauriston R. King of East Carolina University.

Coastal Processes

- **"Enhancing the Scientific Basis for Predicting Fish Habitat Impacts of Beach Nourishment,"** by Charles H. "Pete" Peterson of the UNC-Chapel Hill Institute of Marine Sciences.

Water Quality and Habitat

- **"Increasing Ammonium Concentrations in the Cape Fear River Estuary: Where is it Coming From?"** by Robert Kieber, Joan Willey and Stephen Skrabal, all of UNC-Wilmington.
- **"Linking Changes in Human Nitrogen Input to Eutrophication, Harmful Algal Blooms and Trophic Alteration in the Neuse River Estuary and Pamlico Sound, N.C.,"** by Hans W. Paerl and Luke J. Twomey of the UNC-Chapel Hill Institute of Marine Sciences.
- **"Oyster Reefs as Fisheries Habitat: The Influence of Edge Characteristics and Vertical Complexity,"** by Martin Posey and Troy Alphin of UNC-Wilmington.

Education

- **"Sea-View: Introducing Coastal Processes and Conflicts to North Carolina Students,"** by Karen Dawkins of NC State.

These projects are considered part of North Carolina Sea Grant's "core" program, which receives federal funding from the National Oceanic and Atmospheric Administration and state funding from the North Carolina General Assembly.

In addition, North Carolina researchers often receive funding through a competitive proposal process administered by the National Sea Grant Office to meet national needs, such as oyster disease or aquatic nuisance species.

And through the course of each year, Hodson provides minigrants of less than $10,000 to researchers with smaller projects. "In many cases the minigrants have provided seed funding for more extensive research efforts funded by Sea Grant or other agencies," Hodson says.

"Together," he adds, "the various Sea Grant research efforts provide a solid framework to encourage critical inquiry into topics that affect not only coastal residents but all who care about issues such as water quality and safe and plentiful stocks of seafood."

Watch future issues of Coastwatch *for stories on these and other Sea Grant-funded research projects.*

NORTH CAROLINA:
Pelican Paradise

By Lisa Kowite • Photos by Walker Golder

Ever wonder why pelicans have those huge pouches on their throats? Do these birds like to hang on to a couple of fish for an afternoon snack?

Actually, any fish unlucky enough to end up in that pouch doesn't stay there for long, according to David Lee, curator of birds for the North Carolina Museum of Natural Sciences.

As the powerful *Pelicanus occidentalis,* the brown pelican, takes flight after its watery dive, the fish already has been swallowed.

Lee compares the feeding process of a pelican to that of a baleen whale. Both allow a large amount of water — and food — into their mouths. Just as the whale uses its baleen to retain food and filter out unneeded water, the pelican uses its pouch.

The pelican's flexible lower mandible is pushed back as the bird hits the water's surface. Cartilaginous strips in the pouch expand to hold approximately three pounds of water. Once the pouch is full, it automatically retracts to force water out — leaving behind a tasty lunch.

But for these birds, even the simple act of diving is amazing. Dive-bombing the water from heights of up to 30 feet, pelicans hit the water's surface with tremendous force. They hit so hard, in fact, that they come equipped with an additional layer of tissue.

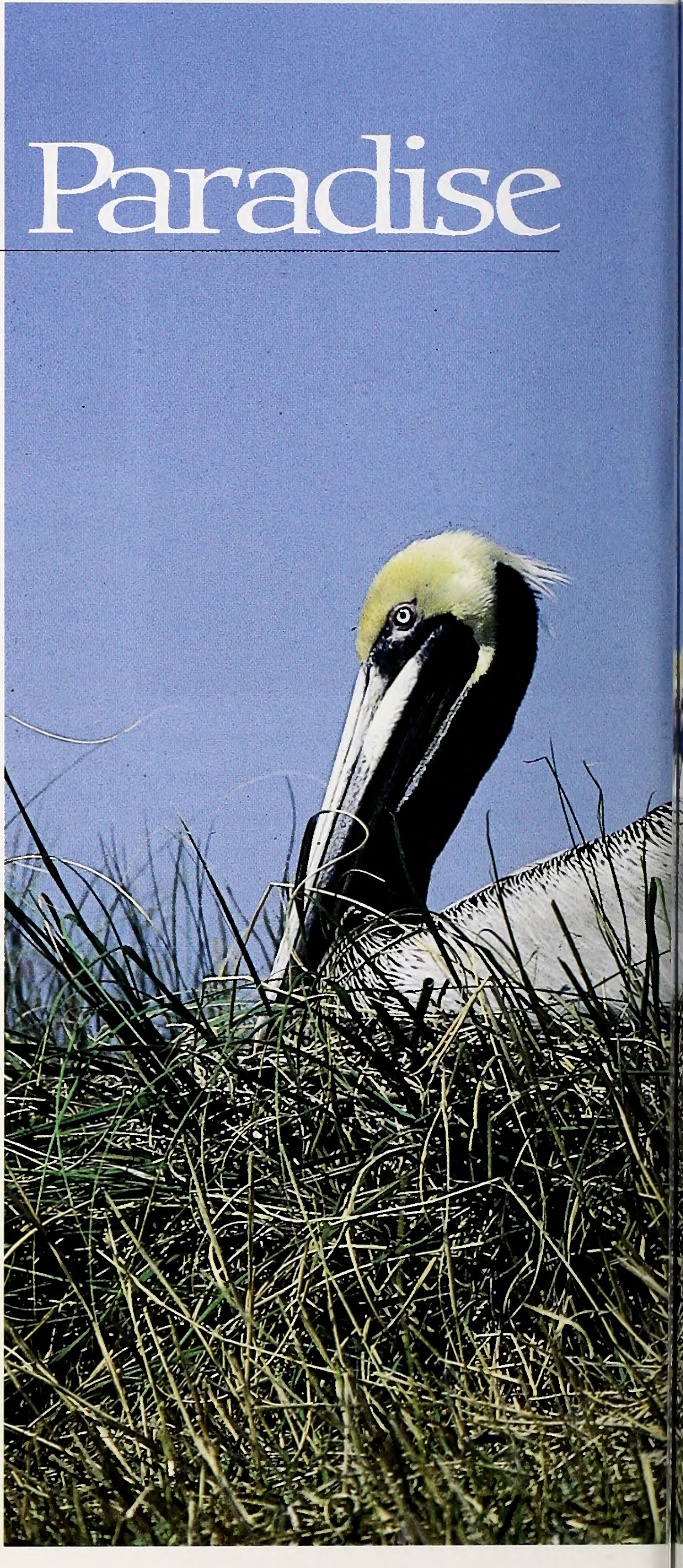
"Right underneath their skin is this stuff that looks like bubble wrap," Lee says. This lightweight layer both protects their fragile bodies from the force of impact and increases buoyancy to prevent diving too deeply. The birds, he says, "are all feathers and air pockets."

A Mysterious Migration

Look around North Carolina's coast these days, and you'll have no trouble finding a brown pelican. It's surprising, considering that up until the 1970s only one small flock was known to nest in the state. In fact, until 1986 brown pelicans along the East Coast were considered endangered.

DDT, used extensively during the mid-1900s, was originally known as a miraculous pesticide. Today, it is known for its disastrous environmental effects. Pelicans were just one of many wildlife species to suffer at the hands of DDT. They experienced eggshell thinning, which resulted in poor reproduction rates. The national population plummeted so low that entire colonies were devastated. DDT was banned in 1972, but not before nationwide damage had been done. Pelicans were placed on the endangered species list.

Continued



Pelicans are among the many nongame species protected by the regulatory authority of the N.C. Wildlife Resource Commission's Nongame and Endangered Wildlife Program.

NATURALIST'S *NOTEBOOK*

North Carolina's then-small pelican population was largely unaffected by DDT, according to Lee. But brown pelicans began coming to the North Carolina coast after DDT was banned — and they came in record numbers.

From a Flock of Few

So why are brown pelicans coming to North Carolina in droves?

To explain the northward spread of pelicans, some suggest global warming. However, Lee says, it's not that simple. While brown pelicans — historically southern birds — are moving northward, traditionally northern birds also are settling down south.

From a national perspective, weather has not affected pelicans' expansion north. However, North Carolina has been experiencing a string of warmer winters, according to James Parnell, emeritus professor of biology at the University of North Carolina at Wilmington. "Pelicans have a tough time in harsh winter weather," Parnell says. "The fish go deeper, and the pelicans can't catch them."

Parnell has witnessed North Carolina's colonization by pelicans since the 1970s, when the only known nesting flock of brown pelicans was on a small island in Ocracoke Inlet. "Then a little colony on the Cape Fear River started in the early 1980s," Parnell recalls.

Dredging of the Intracoastal Waterway leaves huge piles of deposited sand known as dredge spoil islands. Six to 10 years after dredging, these islands had accumulated ample vegetation — dense grasses and low, thick shrubs — to provide ideal nesting sites for brown pelicans.

The creation of dredge spoil islands is a leading contributor to pelicans' arrival in North Carolina. In the late 1970s, Parnell and Robert Soots, who was then on the faculty at Campbell College, began North Carolina Sea Grant studies of the increasing number of species on dredge spoil islands in the Cape Fear region as vegetation flourished. "We looked at the whole ecosystem, especially the plants and the birds," Parnell says. Later studies focused more closely on the bird populations on the islands, including pelicans.

Lack of predation is an equally important benefit of nesting on spoil islands. Because young pelicans have a long dependency on the nest, they make great targets for raccoons, foxes and even household dogs and cats. But these predators usually do not inhabit spoil islands. This makes surviving five weeks of dependency on the nest — ordinarily the most perilous — a breeze for young pelicans on the islands.

Pelicans Aplenty

Human disturbance is a leading threat to pelicans. The North Carolina Audubon Society is aware of the problem of human threat and works actively to protect the birds. Walker Golder, deputy director of the North Carolina Audubon Society, explains their role in pelican conservation: "Another important factor in the success of pelicans is the protection of nesting sites. Because of the long dependency on the nest, they are very sensitive to human disturbance."

Sanctuaries are critical in protecting the young. Audubon sanctuaries at Beacon Island in Hyde County and Wainwright Island in Carteret County are fabulous nesting sites, according to Golder. But don't include these sanctuaries on your vacation sightseeing list. The sites are posted, patrolled and strictly off-limits from March through October to protect those young pelicans until they are able to fly.

Pelicans are among many nongame species protected by the N.C. Wildlife Resource Commission's Nongame and Endangered Wildlife Program. David Allen, who leads the Colonial Waterbird Conservation project, says staff manage 21 state-owned coastal islands and collaborate with other state, federal and private agencies, including Audubon, in managing and protecting sensitive habitat.

A number of state, federal and private agencies collaborate in managing and protecting sensitive brown pelican nesting habitat. The state's pelican population has soared since the 1980s, coinciding with the creation of dedge spoil islands. The lack of predation on these undisturbed sites increases survival rate for the vulnerable young.

But one devastating human threat remains — discarded fishing line. "We find lots of pelicans entangled in fishing line — usually dead," Golder says. The monofilament line wraps around their legs or wings, and can even wrap around young birds if dragged back to the nest. "They die a very slow, struggling death," says Golder.

Although the pelican life is not perfect, North Carolina has yet another bonus. If an ideal home and freedom from predation isn't tantalizing enough, throw in an abundant food supply, and it must be close to bird heaven.

A sharp decline of North Carolina's menhaden commercial fishing industry is an equally important factor in attracting brown pelicans, Lee says. One of the birds' staple foods, plentiful menhaden keep pelicans in North Carolina year-round.

But some pelicans don't even bother trying to catch their own food. These birds find the easiest way to eat is to loiter around fishing wharves where they receive free handouts. Sick and injured pelicans that ordinarily would not survive also take advantage of these handouts.

"Things are really pro-pelican these days," Lee says. "There's no way a biologist would have predicted what has happened with the pelicans. They're beyond common."

From less than 100 nesting pairs to an estimated several thousand, North Carolina exemplifies the successful comeback of the pelican. Golder says, "With good food and good, safe nesting sites, pelicans should continue to do well." ▣

For more information on brown pelicans and the North Carolina Audubon Society, visit the Web at www.ncaudubon.org.

A FEW FUN FACTS

- White pelicans, *Pelicanus erythrorhynchos*, are neither common to North Carolina, nor are they marine birds. During winter months, however, these birds occasionally will rest by North Carolina's marine waters.
- Harassing pelicans is not advised. "You don't want to mess with a pelican," Lee says. "They won't take an arm off, but there can be blood." His advice: "Let the pelicans be pelicans."
- When nesting, pelicans follow a definite pecking order. Upon returning from migration, the oldest arrive first. They secure the safest, innermost nesting spots, while the youngest are left to hold their own at the colony's edge.
- In dense colonies, pelicans must be careful to build nests at least one beak's length apart. Otherwise, their nest will disappear bit by bit — thanks to thieving neighbors.
- Pelican colonies are quite noisy. Adult pelican sounds have been compared to the bray of a donkey and the grunt of a pig. Younger pelicans just bark.

NORTH CAROLINA SEA GRANT
NORTH CAROLINA STATE UNIVERSITY
BOX 8605
RALEIGH, NC 27695-8605

ADDRESS SERVICE REQUESTED

PERIODICALS
POSTAGE PAID
AT RALEIGH, NC

COASTWATCH

G69
7:2002/3

RRENTS • THE COASTAL SOCIETY • NEW OZONE USES

Coastwatch

North Carolina Sea Grant • Early Summer 2002 • $3.75

HURRICANE RESISTANCE

FROM THE EDITOR

Summertime Safety

Herman Lankford

"Be careful," our parents always admonished, even when *we* knew we were just going to have some fun.

But the older we get, we find that our parents were making sense after all. And thus, while we are planning our summer beach visits, we should remember to pack a good dose of common sense — and the memory of our parents' simple wisdom.

The draw of the ocean waters varies. There's the excitement of body surfing. Or the slow process of the tide washing away our sand castles, one wave at a time.

But, as Kure Beach Police Chief Dennis Cooper explains later in this issue, jumping in the ocean is not the same as playing in a backyard swimming pool. The ocean includes the power of nature, as seen in rip currents.

At the coast, you can watch for more than 500 signs that alert beach-goers to the warning signs of rip currents. Again, a simple dose of caution can alert you to the risk of rip currents. For more information on rip current forecasting, check my story on page 6. Or go directly to page 11 for a list of telltale signs.

And because the ocean is an ecosystem, complete with wildlife, you may feel the tickle of small baitfish swimming near shore. And, you should be aware that sharks are found in coastal waters.

To explain the role of sharks along the East Coast — including North Carolina — the Sea Grant National Media Relations office and the NOAA/National Marine Fisheries Public Affairs office will host a media briefing at the National Press Club in Washington, D.C., on May 21.

Watch for news reports that week in the general media — and check back in the next issue of *Coastwatch* as well. In fact, educators, students, beach business owners and others may be interested in following the entire news briefing — which will feature two international shark researchers and an official from NMFS — on the Web. Check *www.seagrantnews.org* for details.

And again, taking some proactive steps when it comes to designing or renovating a home can save your house — if not your life. On page 12, Spencer Rogers, our coastal construction specialist, offers tips to improve hurricane resistance in new or existing homes.

On another note, spring is a busy time for the Knauss Marine Policy Fellowship. Sponsored by the National Sea Grant Office to honor one of the founders of the Sea Grant Program, the Knauss fellowship provides graduate students an opportunity to participate in policy development in congressional offices and at executive-level agencies.

In April, applicants for the 2003 program were busy completing essays and getting references, and in many cases, meeting with local Sea Grant officials. But, this spring has also brought a touch of sadness for the Knauss program.

Steve Whitesell, a 1994 Knauss fellow from North Carolina, was killed in a traffic accident in February. In addition to his year in the Knauss program, Steve had spent a year working on a Sea Grant project on ocean stewardship with Walter Clark, our marine policy specialist. More recently, Steve was an attorney focusing on affordable housing and community development.

"Steve approached his work and his friendships with rare sensitivity — with a sense of direction, calm and grace," Walter says.

Our thoughts are with Steve's family.

Katie Mosher, Managing Editor

IN THIS ISSUE

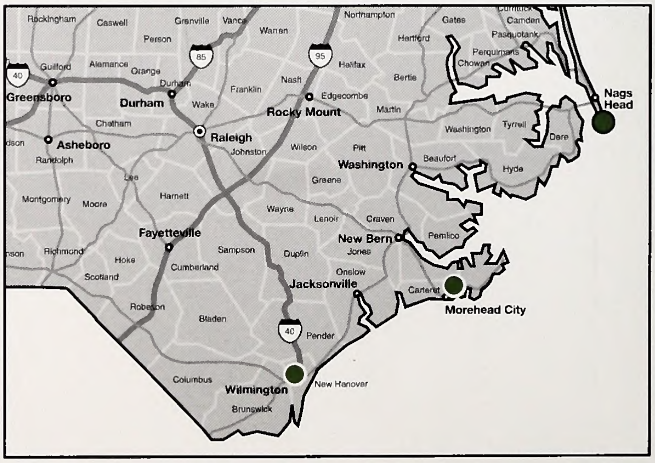
Contributing Writers:

Ann Green ▫ Katie Mosher ▫ Pam Smith

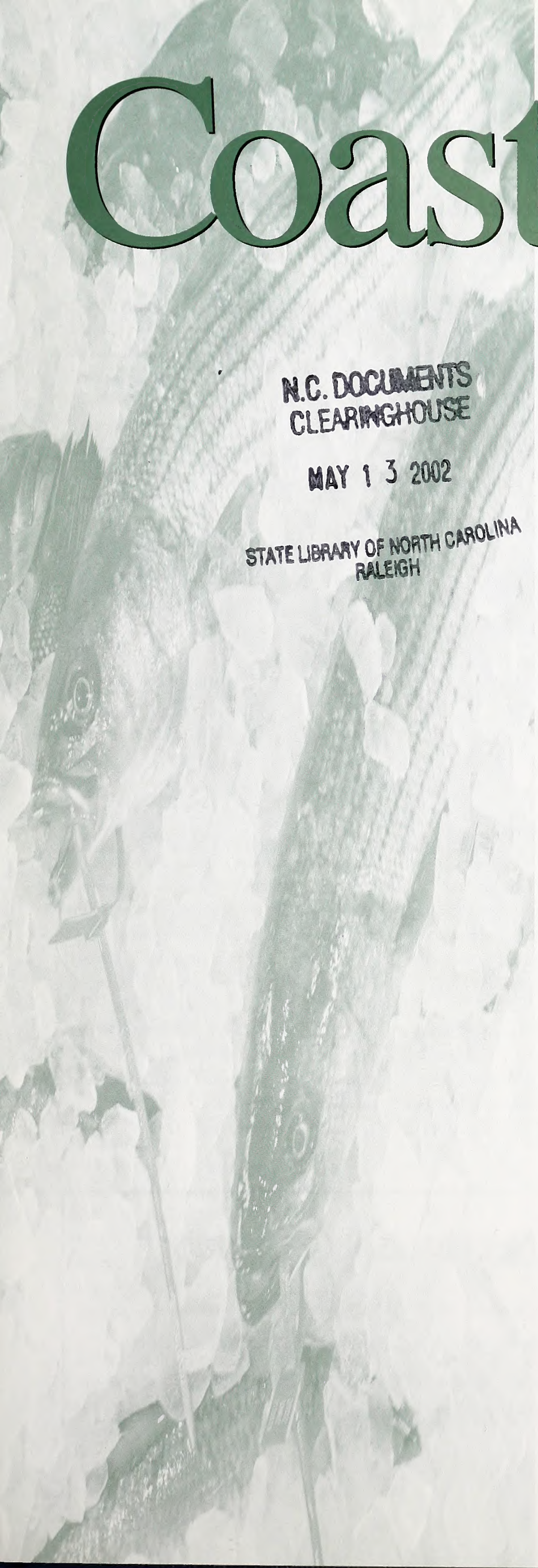
Contributing Photographers:

Michael Halminski ▫ Herman Lankford ▫ Doug Smith
Pam Smith ▫ Scott D. Taylor ▫ Roger W. Winstead

North Carolina's diverse coast offers countless interesting subjects. The large dots on the locator map indicate story settings in this issue — from the Outer Banks in Dare County to Wilmington in New Hanover County.



Coastwatch



N.C. DOCUMENTS
CLEARINGHOUSE

MAY 1 3 2002

STATE LIBRARY OF NORTH CAROLINA
RALEIGH

FEATURES

COASTAL TIDINGS 2

RIP CURRENTS: DON'T PANIC
North Carolina Sea Grant is working with the National Weather Service to spearhead public awareness in beach communities about rip currents. Katie Mosher highlights the safety program and groundbreaking rip current research in Florida. 6

HURRICANE RESISTANCE:
RETROFITTING, STORM SHUTTERS INCREASE SAFETY
The hurricane resistance of many homes can be improved by using a variety of techniques to reduce the chance of structural damage and damage from wind-blown water or flood waters. Ann Green explains new designs for plywood shutters and strong rooms. 12

THE COASTAL SOCIETY:
THE WHOLE IS GREATER THAN THE SUM OF ITS PARTS
An international organization, The Coastal Society celebrates its 25th anniversary this year. Pam Smith chronicles the TCS leadership legacy and its influence on North Carolina. 17

PEOPLE AND PLACES:
Midgett Brothers: "Wildest Bus Ride" on Hatteras Island
A bus line was the first public transportation system on Hatteras Island. Ann Green relates stories from Stocky and Anderson Midgett about bumpy bus rides along sandy roads. 21

SEA SCIENCE:
Researchers Find New Use for Ozone
A new study found that treating raw fish and processing equipment with ozone greatly reduced the number of bacteria that could spoil seafood. Ann Green looks at the potential benefits of ozone in seafood processing plants. 23

THE CATCH:
Catch It and Cook It
The recreational angler has countless possibilities for catching the limit without leaving solid ground. Pam Smith gives some tips for gearing up and shares some tasty recipes from Joyce Taylor. 26

Coastwatch

Managing Editor
Katie Mosher

Senior Editors
Ann Green
Pam Smith

Contributing Editor
Cynthia Henderson

Designer
L. Noble

Circulation Manager
Sandra Harris

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 15-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X)
is published six times a year by the
North Carolina Sea Grant College Program,
North Carolina State University, Box 8605,
Raleigh, North Carolina 27695-8605.
Telephone: 919/515-2454. Fax: 919/515-7095.
Subscriptions are $15.
E-mail: katie_mosher@ncsu.edu
World Wide Web address:
http://www.ncsu.edu/seagrant
Periodical Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to
Coastwatch, North Carolina Sea Grant,
North Carolina State University, Box 8605,
Raleigh, NC 27695-8605.

Sea Grant
North Carolina

Front cover photo of house under construction and table of contents photo of fish by Scott D. Taylor. Printed on recycled paper.

COASTAL *TIDINGS*

Oyster Research Projects Selected by National Sea Grant

Roger W. Winstead

The dramatic decline in oyster reefs in estuaries along the U.S. coastline, coupled with the rising recognition of the ecosystem benefits from oyster reefs, has led to increasing efforts to restore and conserve oyster reef habitat.

Charles "Pete" Peterson of the University of North Carolina at Chapel Hill has received National Sea Grant College Program funding to examine the success of oyster reef restorations. A second National Sea Grant oyster project, by Daniel Baden and Jerome Naar of UNC-Wilmington, will improve methods of detecting brevotoxins following "red tide" outbreaks.

The UNC-CH study will focus on how oyster diseases, such as the microscopic parasite known as Dermo, have affected the success of reef restoration efforts. The project's conclusions will include recommendations for future reef restoration efforts.

Reefs in sanctuary areas are not disturbed by commercial fishing gear — thus, Peterson wants to know how Dermo affects those reefs. Dermo kills many oysters in commercial shellfish areas before the bivalves reach harvestable size. Oysters that survive past that point within the sanctuaries may have genetic inclinations against the parasite and other problems.

The UNC-W project focuses on the "red tide" events that close shellfish areas along the Gulf Coast — at what some estimate is an economic loss of $49 million annually. North Carolina also has had red tide events, but not on an annual basis.

Before these areas can be reopened for shellfish harvesting, officials must know that the brevotoxins produced by the harmful algae are not at dangerous levels. Baden and Naar are conducting new antibody bioassays — known as ELISA — through an in-vitro process, rather than by the current standard of testing mice.

Working with collaborators in Texas and Florida as well as officials in five Gulf States, they are pleased with preliminary results.

The testing measures both the toxins from the algae and the toxins from the oysters themselves. The researchers expect to define a new permissible level based on the more accurate — and more rapid — assays. — K.M.

In the Next Issue of *Coastwatch*

How have fish responded to the removal of a dam on the Neuse River near Goldsboro? Cynthia Henderson will join N.C. Fishery Resource Grant researcher Joseph Hightower as he surveys new upriver spawning areas. Ann Green takes readers on a paddle trip down the Waccamaw River where rare plants and animals thrive.

Hurricane Expo Set for June 8

Want to be prepared for the next hurricane?

Attend Hurricane Expo 2002 from 10 a.m. to 5 p.m. June 8 at the Schwartz Center at Cape Fear Community College in downtown Wilmington. The expo is co-sponsored by WECT News 6 and Cape Fear Community College.

More than 50 exhibitors, including North Carolina Sea Grant, will showcase information and products to help educate the public about preparedness and recovery, according to Bob Townsend, WECT community affairs director. For more information on the expo, contact Townsend, *btownsend@wect.com*. For more information on hurricane retrofitting for coastal homes, turn to page12.

– A.G.

North Carolina Aquariums

Aquarium Reopens at Fort Fisher

Visitors to the North Carolina Aquarium at Fort Fisher can follow the "Waters of the Cape Fear" from the river's headwaters, across the Piedmont, through saltwater swamps and into open ocean waters.

The aquarium reopened recently after a two-year makeover that tripled its size and broadened its scope.

The Open Ocean Gallery features a 235,000-gallon "Cape Fear Shoal" that gives a spectacular view of nearly 500 saltwater creatures. Several times a day, staff and volunteer divers clean and maintain the tank — and engage in conversation with visitors using a high-tech underwater communication system.

The Coastal Waters Gallery provides close encounters with sea stars and horseshoe crabs, while the Masonboro Inlet Jetty showcases bluefish, red drum and other favorites of coastal anglers.

In addition, the Cape Fear Conservatory — a newly added half-acre space — includes freshwater streams, ponds and waterfalls, as well as alligators, snakes, carnivorous plants and a variety of indigenous fish.

The reopening of the aquarium marks the completion of two of the three aquarium expansion plans first approved by the N.C. General Assembly in 1993. The Roanoke Island facility reopened two years ago highlighting aquatic life of the upper coast. Expansion of the Pine Knoll Shores facility, which features coastal environments of the middle coast, has not begun.

The aquariums are open daily (except Thanksgiving, Christmas Day and New Year's Day) from 9 a.m. to 5 p.m. For information about events and programs at each location, go to *www.ncaquariums.org*.

– P.S.

UNCW/NOAA National Undersea Research Center

UNC-W Undersea Research Center Gets Funding

The University of North Carolina at Wilmington has been awarded $2 million to continue a marine research program that features the nation's only underwater laboratory station.

UNC-W's National Undersea Research Center (NURC) is one of six research centers funded by the National Oceanic and Atmospheric Administration. The center at UNC-W supports undersea research off the southeastern United States from North Carolina to Texas. NURC facilities and staff are located at the university's Center for Marine Science in Wilmington and at Key Largo, Fla.

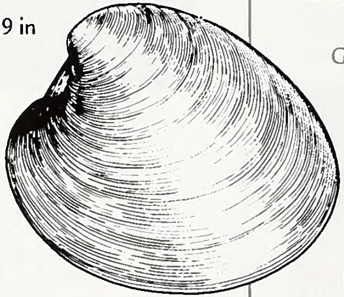
Scientists from around the country conduct research using NURC submarines, remotely operated submersibles and *Aquarius*, an underwater ocean laboratory. Located off the Florda Keys, the 81-ton *Aquarius* allows teams of six scientists to spend up to 10 days doing research at depths of more than 60 feet.

Scientists have studied the nature of offshore pollution, coral communities, the causes of algal blooms, and the effects of commercial fishing on marine ecosystems.

For additional information about NURC, go to *www.uncwil.edu/nurc/*. – P.S.

Mariculture Conference Planned

The "North Carolina Mariculture Conference" is being planned for June 29 in Morehead City. The conference, sponsored by North Carolina Sea Grant, will address saltwater mariculture including finfish, crustacean and shellfish culture operations. The conference will be at the Trinity Center on Bogue Banks.



Skip Kemp, Sea Grant mariculture specialist, will introduce the concept of "Backyard Shellfish Gardening" for environmental enhancement.

An optional evening social, "The Tastes of North Carolina," will feature the regional differences in the tastes of shellfish. The social also will highlight North Carolina wines that compliment shellfish.

There will be an additional fee for the social. The conference registration fee of $15 will cover lunch and breaks.

For information, contact Skip Kemp in Morehead City at 252/222-6314 or *skip_kemp@ncsu.edu*. – P.S.

Clam illustration by John Norton

New Publications Highlight Sea Grant Outreach

New publications from Sea Grant underscore the diversity of outreach to citizens of North Carolina. Each has a special take on the environmentally sound use of coastal resources.

- **Shellfish 4 Us: Backyard Shellfish Gardening**

"Shellfish 4 Us: Backyard Shellfish Gardening," a Sea Grant *Blueprint*, is a how-to guide for waterfront residents in North Carolina who want to grow clams or oysters along their shorelines. The guide lists state agencies to contact for rules and regulations about shellfish harvesting and Internet links for additional shellfish gardening information. (UNC-SG-BP-2002-01)

- **Closed Crab Shedding System: Quick Reference Guide**

Important facts you need to know for start-up and maintenance of a shedding system have been synthesized onto a two-sided, letter-size card by Sea Grant specialists.

The informative publication takes you step-by-step from tray design and materials through filtration methods and management guidelines. (UNC-SG-02-01)

- **Reducing Peeler and Soft Crab Mortality: From Harvest to Delivery**

A companion piece to the publication described above, this two-sider instructs the operator on molting, or shedding, cycles; mortality rates; harvesting gear; and handling peelers and soft crabs. It adds up to sound suggestions to help reduce mortality – and increase profits. (UNC-SG-02-02)

- **Catch and Release: A Guide to Ethical Angling**

This publication covers the principles of ethical angling and a practical how-to guide to catch and release using circle hooks. Following simple ethical angling pratices, recreational anglers can make a difference in the conservation and management of fish populations. (UNC-SG-02-03)

For free copies of any of these publications, call North Carolina Sea Grant at 919/515-9101. – P.S.

Boat Building Exhibit at History Center

Outer Banks History Center

At his boat building yard on Dough's Creek in Dare County, Capt. Warren O'Neal transformed sportfishing boats with his famous deep-V hull and Carolina flare.

The "Captain Warren O'Neal, Carolina Boat Builder and Fisherman: Legacy and Works" is on exhibit through the end of May at the Outer Banks History Center in Manteo.

The exhibit includes O'Neal's handcrafted tools, half-hull models, drawings, photographic images and historic fishing apparatus.

O'Neal grew up on Roanoke Island and designed his boats to withstand the treacherous waters of Oregon Inlet.

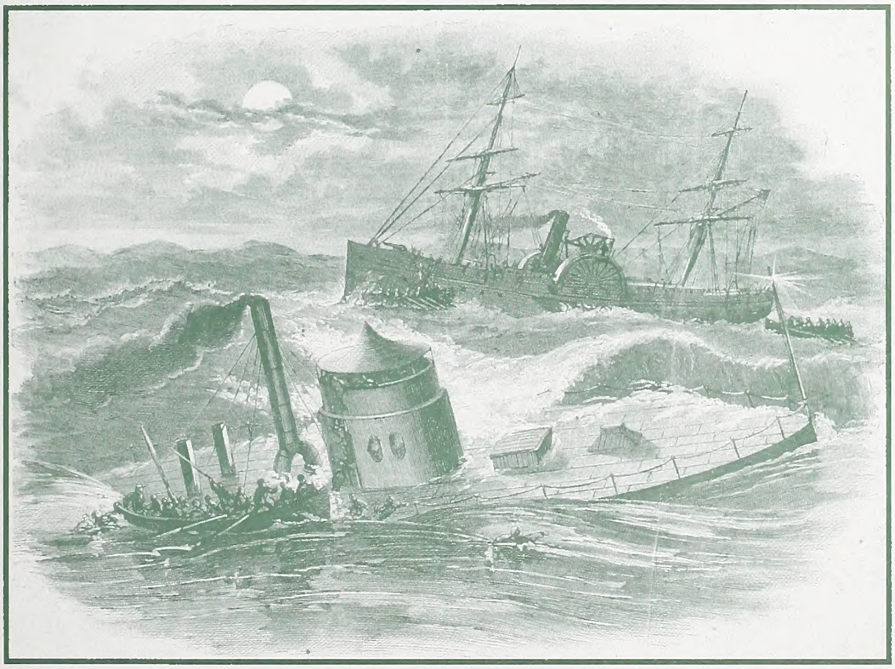
The exhibit is open seven days a week from 10 a.m. to 5 p.m. For more information, call 252/473-2655 or e-mail, *brian.edwards@ncmail.net*. – A.G.

Guide for N.C. Environmental Groups

Need a handy reference guide for environmental programs in North Carolina? Order the updated *Guide to North Carolina's Environmental Groups 2001-2002.*

The booklet, produced by the School of Public Health and the Carolina Environmental Program at the University of North Carolina at Chapel Hill, provides vital information about the state's groups — from contacts and meeting dates to issues and activities.

To order a guide, call 919/966-7754 or e-mail, *erp@unc.edu.* To order online, go to *www.sph.unc.edu/erp.* — A.G.



Monument Recalls Science & History

Beaufort officials recently unveiled a monument that some say is a tribute to both science and history.

The granite monument on the town's waterfront honors the late John G. Newton, who is credited with the 1973 discovery of the *USS Monitor* in its watery grave off Hatteras.

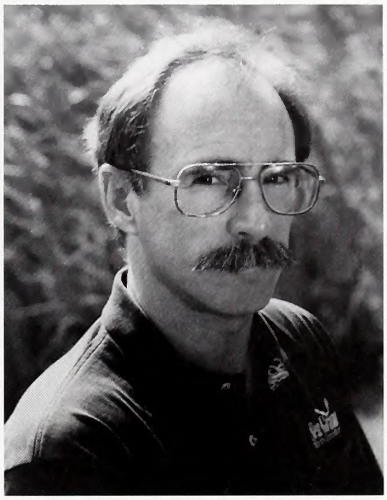
Newton, a former Duke Marine Laboratory superintendent, led the Duke University research team at the time of the discovery. He later headed up the Monitor Research and Recovery Foundation. He also was instrumental in having the *USS Monitor* site named as the nation's first Marine Sanctuary in 1975. Newton died in 1984 at the age of 52.

Newton's monument stands a few feet from a memorial to another town hero, the late Capt. Mike Smith, who commanded the 1986 *Challenger* mission that ended in disaster.

One explored the depths of outer space and the other explored ocean depths, recalled Beaufort Mayor Tom Steepy during unveiling ceremonies.

The *USS Monitor* fought *CSS Virginia* (also known as the *Merrimac*) in the first battle between ironclad vessels on March 9,1862. It sank in a storm off Cape Hatteras on Dec. 31, 1862, while under tow to Union-occupied Beaufort.

The monument honoring Newton was dedicated on the 140th anniversary of the famed Civil War battle. — P.S.



Scott D. Taylor

Spencer Rogers Receives Award

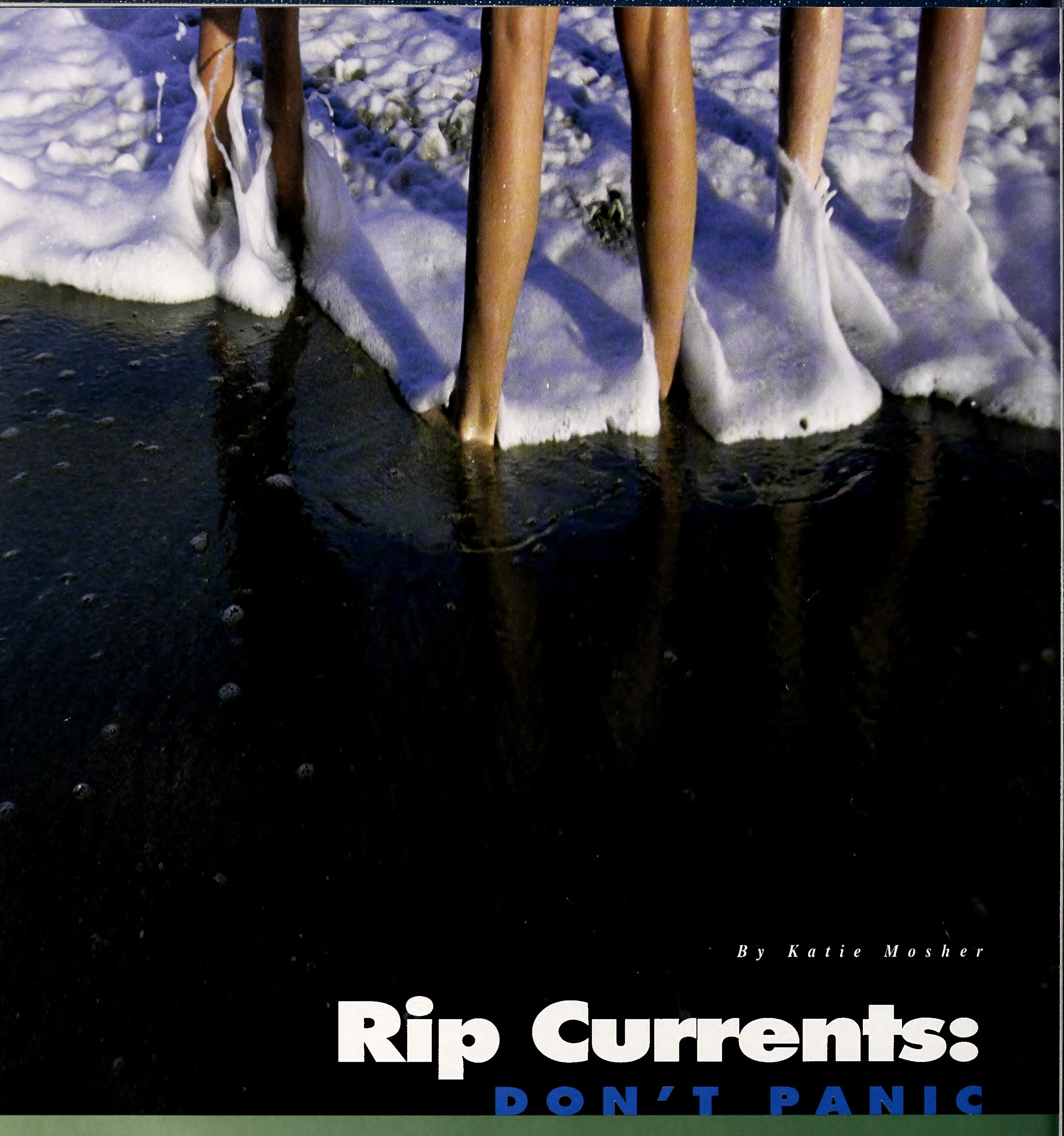
Spencer Rogers, North Carolina Sea Grant coastal and construction engineering specialist, received the 2002 Professional Practice Award during ceremonies at a recent American Society of Civil Engineers (ASCE) conference in San Diego.

The award was presented by the Coastal Zone Management Committee of ASCE's Oceans, Ports and Rivers Institute. Rogers was cited "for his years of service as a coastal engineering specialist and his dedication to the coordinated practice of coastal engineering, science and management."

Rogers co-authored two papers presented at the conference: "Selecting Erosion Setbacks for Balanced Multi-Hazard Risk" and "Establishing Standards for Building Setbacks: Incorporation of Erosion Rate Vulnerability." He also moderated a panel discussion on "Coastal Storms: Building Damage and Design."

Rogers, who joined Sea Grant in 1978, is based at the University of North Carolina at Wilmington's Center for Marine Science. He teams with academic, government and industry leaders seeking solutions to coastal hazard mitigation issues. He can be reached at 919/962-2491 or *rogerssp@uncwil.edu.*

— P.S.



By Katie Mosher

Rip Currents:

DON'T PANIC

RIP CURRENTS CAN BE KILLERS...

...DO YOU KNOW WHAT TO DO?

This summer, countless beach lovers — from first-time visitors to coastal residents — will flock to the North Carolina shoreline to enjoy the lapping surf of the Atlantic Ocean.

And while tourist ranks are substantial, the state tallied only three rip current fatalities last year.

"We have so many more people visiting the beaches, but the number of fatalities has not increased — in fact, it is going down," says Sandy Sanderson, Dare County's emergency management director, who cites a "chain of successful education efforts."

A new link in the chain is the posting of more than 500 rip current signs at beach parking lots, crossovers, lifeguard stands and other sites. North Carolina Sea Grant is spearheading the project, in conjunction with local officials and the National Weather Service (NWS), part of the National Oceanic and Atmospheric Administration.

Rip currents are found not only along the ocean shoreline, but also along the Great Lakes. The rip currents form when water rushes out to sea in a narrow path. Often they form in a break in a nearshore sandbar, or near a groin, jetty or pier. Swimmers or waders who are unaware of telltale signs of rip currents may get caught in the strong pull.

"I think we have made tremendous progress in educating the public — but it is an ongoing education process," Sanderson says.

Thomas Best agrees. As fire marshal in North Topsail Beach, he came to Sea Grant last year with a request for aluminum signs as a permanent education tool. By this spring, his town had posted about 65 new signs, each about the size of a "No Parking" sign.

"We put the signs at the crossovers, where people have to step up. They have to see the sign," he says.

Sanderson, Best and others up and down the coast have worked with Spencer Rogers, North Carolina Sea Grant's coastal erosion specialist, and the Sea Grant communications team on a number of rip current projects, including a video, posters and a brochure.

Last year, North Carolina offices of the weather service began offering daily forecasts for rip current potential, a service patterned after a forecast scale developed in Florida through the work of NWS, local lifeguards and university researchers.

Soon, NWS will unveil its new online "portal" for rip current information: *www.ripcurrents.noaa.gov*.

And, beach communities continue individual educational campaigns on beach safety issues. Thus, it is a coordinated effort to get the word out regarding rip currents.

"The key message is: Don't panic," adds Rogers.

EQUAL CHANCES

A strong rip current can move at about three feet per second — as fast as an Olympic swimmer in a 50-meter sprint — according to Sea Grant researchers in Florida.

So, when it comes to rip currents, everyone is equal. "I have rescued people of all ages, all swimming abilities and all sizes. They all can get caught in a rip current," Sanderson explains.

The same is true in other beach towns. "Rip currents occur throughout the year, but the biggest problems are in tourist season — they (tourists) don't know what to look for, what they can get themselves into," Best says.

Each year, about 100 fatalities nationwide are attributed to rip currents — and overall, officials estimate that 80 percent of all ocean rescues by lifeguards involve rip currents. In fact, the U.S. Lifesaving Association annually tallies more than 22,000 rescues nationwide that can

Continued

Doug Smith

Kitty Hawk Ocean Rescue

Kitty Hawk Ocean Rescue

TOP: More than 500 rip currents safety signs are now posted along the North Carolina shoreline. BOTTOM: Kitty Hawk's ocean rescue team provides safety lessons and monitors water conditions.

be linked to rip currents. That total may not include rescues by other beachgoers, police and rescue squads.

Best tells of one day a few years back, when five people on plastic rafts and other floats were caught in a rip current not far from Topsail Island's northern tip.

While the rescue team members, each wearing a lifejacket, were helping that crowd, another emergency was reported less than a mile away. So, Best headed to the second location.

"Nine people were in the water, making a human chain to help one person caught in the rip, but those at the end of the chain were getting pulled away," Best recalls. "We gathered them and took them parallel to the beach."

Swimming parallel to shore — rather than fighting the rip current — is a focus of the educational efforts. Most trouble spots are less than 30 feet wide.

If you cannot swim across the rip current, float calmly until it dissipates, usually just beyond the breakers — then swim diagonally to shore. "If you cannot swim, stay in wading depths close to shore," Rogers advises.

Emerald Isle physician Arthur H. Hemmerlein recalls his family's encounter with a rip current years ago: "My wife and son were on inner tubes, and suddenly they started heading out to sea," Hemmerlein says. "I went out to pull them back in, but I didn't really know what to do. Luckily, we had something to hang onto."

Later, when Hemmerlein saw Sea Grant's rip current posters — with simple instructions and illustrations — he appreciated the direct message. He encouraged the Sea Grant office to transfer the message and graphics to a brochure that he could provide his patients.

Hemmerlein then purchased 5,000 brochures that have been given away by rescue squads and tourist locations throughout Carteret County. Overall, more than 50,000 Sea Grant rip current brochures have been distributed in North Carolina and across the country.

TURNING TO SCIENCE

A deadly series of rip currents in the summer of 2000 got the attention of Steve Pfaff and other NWS staff along the North Carolina coast. At least 10 fatalities were reported in the state that year.

Pfaff, who heads marine outreach efforts in the NWS office in Wilmington, knew of Sea Grant's safety program, but he wanted to go further — to begin forecasting when conditions would be optimal for rip currents along individual stretches of shoreline.

He turned to Rogers and others for background on particular geological features of the North Carolina shoreline. And he looked to NWS offices in Florida and Sea Grant researchers at the University of Florida for factors used in rip current forecast models.

By Memorial Day 2001, the weather service had unveiled an online rip current forecast system for the Wilmington region that stretches from Topsail Island to Myrtle Beach, S.C.

In the Morehead City NWS office — which includes the Crystal Coast and Dare County

— the rip current program is coordinated by Jeff Orrock and Mike Colby. In the Wakefield, Va., office — which includes Currituck County in North Carolina and the Virginia Beach area — the contact is Paul Houle.

"Town officials and county leaders are checking it daily, and the forecasts have become part of the television stations' weather broadcasts," Pfaff says.

"Even local papers are helping us spread the word when the threat for strong rip currents are high — and, along with other media outlets, they give NWS rip current forecasts more public exposure," adds Pfaff, who received the Wilmington NWS office's "Isaac Cline Award" for his outreach efforts.

The North Carolina models are derived from groundbreaking work done in Florida. Early work included forecasts by Jim Lushine of the Miami office of the NWS. Randy Lascody of the Melbourne NWS office transferred the models to other areas within Florida. Also, a team of Sea Grant rip current researchers at UF includes Bob Dean, Dan Hanes and Robert Thieke, as well as several graduate students

"We used to believe that the formation of rip currents was relatively spontaneous and correlated with individual events such as large storms," says Dean. "Now, we're starting to believe rip currents persist for longer time periods at various strengths — sometimes as long as several weeks or months."

Doctoral student Jamie MacMahan analyzed thousands of time-lapse images of a beach stretch near the U.S. Army Corps of Engineers research facility in Duck, on the North Carolina Outer Banks. He was able to correlate the images to wave data and other information from offshore buoys.

The images revealed dark swaths of the ocean, which the researchers describe as rip current channels that are persistent in time. As weather and surf conditions varied, the swaths expanded or shrank — but remained in the same general location even after most storms.

Only a particularly large storm or hurricane moved the channels — and/or erased the longshore sandbar system until a new rip channel formed. "We've identified some rip current channels that start in May and last until September," MacMahan said.

While rip channels may be fairly common, they become noticeable — and dangerous — when the flow of water is sufficient to create a strong current, the researchers concluded. Factors include storms that push large amounts of water toward shore, piling water into the gap between the sandbar and beach.

"One of the biggest misnomers is 'rip tide,'" MacMahan says. While rip currents are not part of the tidal system, they can be influenced by tides that lower the beach elevation.

The Sea Grant team also has found that when waves are breaking in a fairly solid line parallel to the shore, the risk for rip currents is higher than if the breaks come at a rippling diagonal toward shore. But if the angle of the breaking waves becomes too big, longshore currents may form, rather than rip currents.

To map the nearshore bathymetry — or flow of the ocean floor — along beaches in Florida, the researchers put instruments on personal watercraft and deploy the instruments in rip channels. Early this summer, the team will spend a month in Daytona Beach gathering additional data.

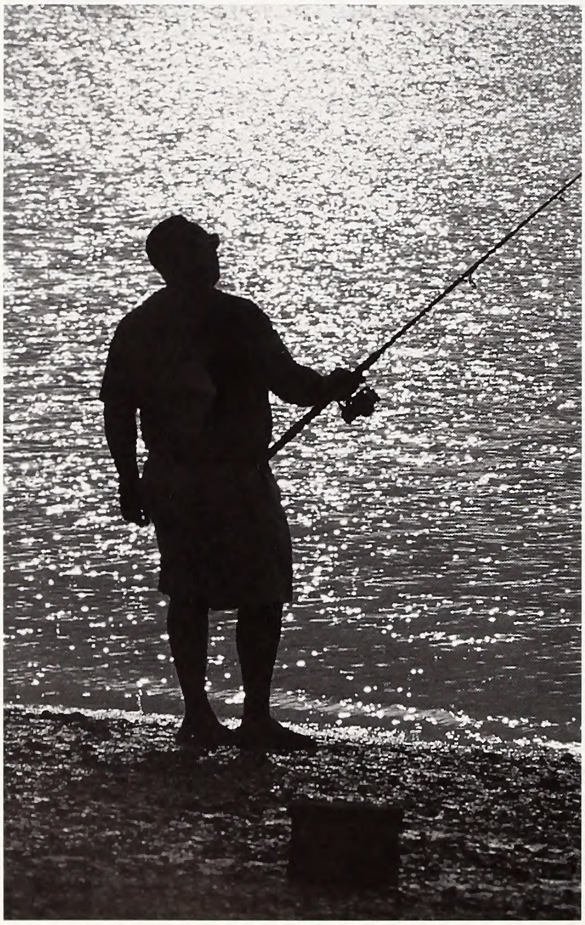
"We need more quantitative measurements, then we will be able to make better correlations," MacMahan says.

Continued

NO SWIMMING
May 21 01 13:01:10 Time-Averaged
240 images averaged over 3 minutes, 1.33 frames/sec
Netscape
Rip Currents
WFO Wilmington, NC
Wednesday's Rip Threat
RIP CURRENT IDENTIFICATION

TOP TO BOTTOM: The red flag signals "no swimming" if rip currents are present. In Kitty Hawk, violators are fined $250. Rip currents can be identified in aerial views. To link to local forecasts, go to the National Weather Service at www.ripcurrents.noaa.gov.

N.C. Travel & Tourism



Scott D. Taylor

Even if rip currents keep beach visitors out of the water for the day, there are plenty of oceanfront activities available, including sand castle building and surf fishing.

SAVING LIVES

Sea Grant researchers have a simple goal in understanding rip currents and developing better forecasts. "To save lives," says Dan Hanes, a co-investigator on the Florida project.

Thus, as Jason Engle, a UF master's student, defines relationships between weather/wave data and rescue statistics, he shares the results with community groups, such as the Florida Shore and Beach Preservation Association.

"In Florida, rip currents, on average, kill more people every year than all other meteorological events combined — that includes hurricanes, tornadoes, lightning, etc.," Engle says, citing NWS statistics. "We are looking to improve the rip current forecast scale used along East Central Florida."

Although rescue team logs are qualitative descriptions of conditions by nonscientists, the researchers have found the lifeguard data to be quite accurate. "We listen to the lifeguards a lot," Engle says. "And one advantage of using rip rescue data is that it is long term."

In particular, he has found that in Volusia County, home to Daytona Beach, there is at least one rip current rescue every three days — and some days have 45 or more.

Similar research has started in North Carolina, though on a smaller scale. Lifeguards and rescue teams along the coast provide updates to forecasters to fine-tune the models. "It is very important to have close contacts with the beach communities," says Pfaff.

Those contacts tallied seven rip current-related fatalities last year from Virginia Beach to South Carolina's "Grand Strand" that includes Myrtle Beach. In nearly every case, the weather service had identified a higher than normal threat for rip currents, Pfaff says.

The North Carolina and Florida forecasting efforts are part of a nationwide push, he adds, citing a Spanish translation of the online rip current information by an NWS office in Texas.

Meanwhile, Rogers and other Sea Grant coastal processes specialists around the country keep each other updated on various projects. He cites Delaware Sea Grant's efforts, including a training video and interpretive signs, as well as projects in Wisconsin and Michigan.

And, of course, the beach communities play an important role.

In January, NWS officials honored Police Chief Dennis Cooper of Kure Beach, who has rallied his town on beach safety issues including rip currents.

"We are building general awareness," he says. "Kure Beach is a place where people come back year after year."

For example, he wants visitors to know that rip currents often occur when lifeguards are not on duty — especially in the evening and after Labor Day.

"I want visitors to understand that when they step into that water, they are stepping into an *ocean*," he says, emphasizing the grand concept of ocean.

"Once you jump into Mother Nature, you have to be aware. You have to be careful." ▣

Safety Message Makes Difference

During the busy summer season, Cole Yeatts, Kitty Hawk's director of ocean rescue, and his lifeguards take time to talk with visitors about rip currents and other beach safety topics.

And as Christina Lafex of Connecticut can attest — the messages are priceless.

Lafex admits she hadn't paid much attention when Yeatts stopped to talk with her family in July 2001. While swimming that evening, she found herself trying to come back to shore — but she was caught in a rip current.

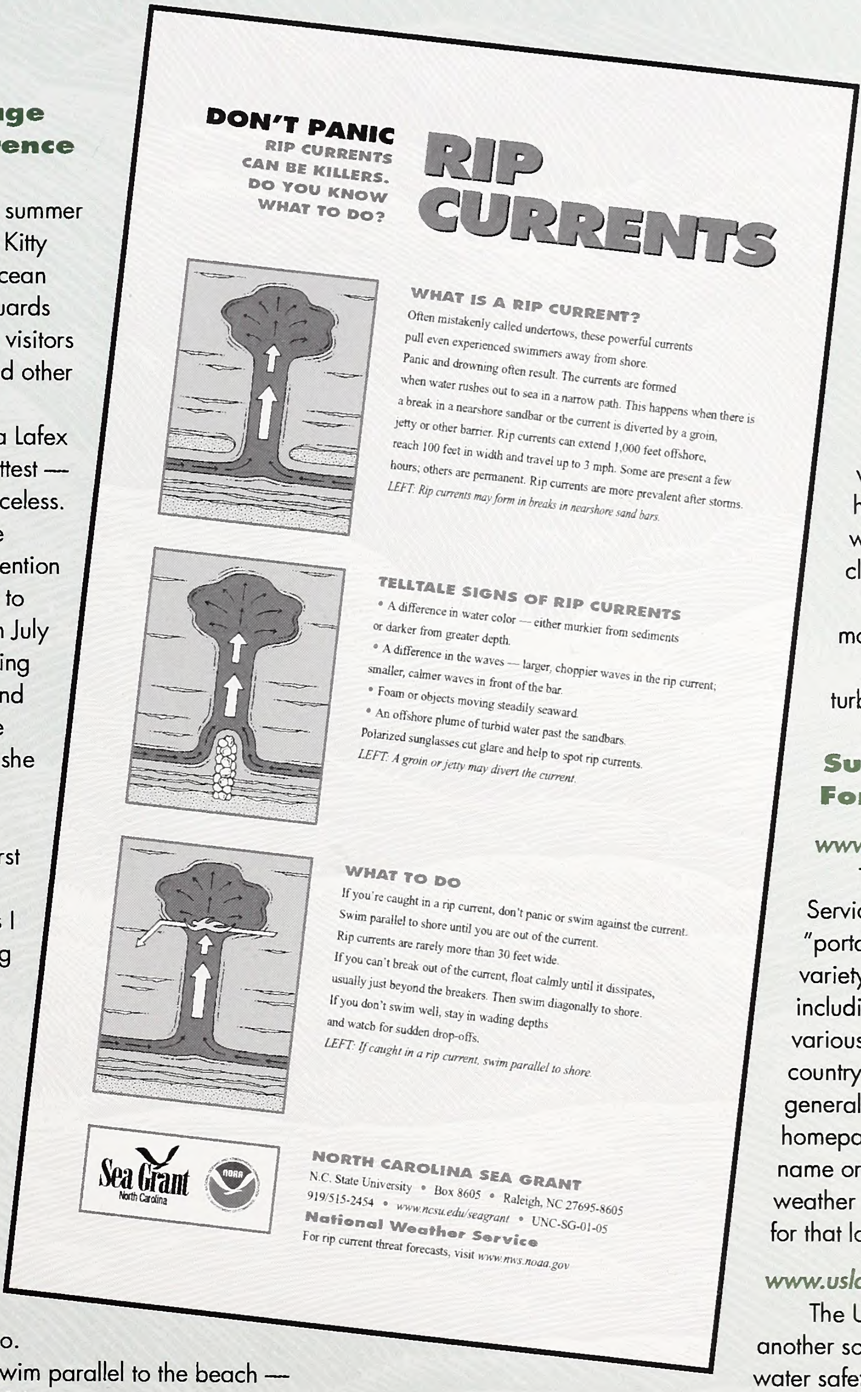
"I panicked at first because I was swimming as hard as I could, but kept getting farther and farther out," she told *The Coastland Times*. "But then I thought of the words that Cole said."

Just as Yeatts had instructed, she realized that she needed to compose herself and think about what to do. She remembered to swim parallel to the beach — and soon was clear of the rip current.

The next day, she looked for Yeatts to share her success story. If it hadn't been for his chat, "I would be underneath the water right now," she said.

Yeatts' informal beach talks are combined with presentations at time-share communities and at the N.C. Aquarium at Roanoke Island. The town also has posted rip current signs and includes information on its Web site. Each part reinforces the basic safety message.

"It is very beneficial," Lafex said. — K.M.



DON'T PANIC

RIP CURRENTS CAN BE KILLERS. DO YOU KNOW WHAT TO DO?

RIP CURRENTS

WHAT IS A RIP CURRENT?

Often mistakenly called undertows, these powerful currents pull even experienced swimmers away from shore. Panic and drowning often result. The currents are formed when water rushes out to sea in a narrow path. This happens when there is a break in a nearshore sandbar or the current is diverted by a groin, jetty or other barrier. Rip currents can extend 1,000 feet offshore, reach 100 feet in width and travel up to 3 mph. Some are present a few hours; others are permanent. Rip currents are more prevalent after storms.

LEFT: Rip currents may form in breaks in nearshore sand bars.

TELLTALE SIGNS OF RIP CURRENTS

- A difference in water color — either murkier from sediments or darker from greater depth.
- A difference in the waves — larger, choppier waves in the rip current; smaller, calmer waves in front of the bar.
- Foam or objects moving steadily seaward.
- An offshore plume of turbid water past the sandbars.

Polarized sunglasses cut glare and help to spot rip currents.

LEFT: A groin or jetty may divert the current.

WHAT TO DO

If you're caught in a rip current, don't panic or swim against the current. Swim parallel to shore until you are out of the current. Rip currents are rarely more than 30 feet wide. If you can't break out of the current, float calmly until it dissipates, usually just beyond the breakers. Then swim diagonally to shore. If you don't swim well, stay in wading depths and watch for sudden drop-offs.

LEFT: If caught in a rip current, swim parallel to shore.

NORTH CAROLINA SEA GRANT
N.C. State University • Box 8605 • Raleigh, NC 27695-8605
919/515-2454 • *www.ncsu.edu/seagrant* • UNC-SG-01-05
National Weather Service
For rip current threat forecasts, visit *www.nws.noaa.gov*

Telltale Signs of Rip Currents

The following are signs that a rip current may be present:

- A difference in water color — murkier from sediments or darker because of greater depths.
- A difference in the waves. The rip current will have larger, choppier waves, while calmer waves are found closer to shore.
- Foam or objects moving steadily seaward.
- An offshore plume of turbid water past the sandbars.

Surfing the Web For Rip Currents

www.ripcurrents.noaa.gov

The National Weather Service is unveiling a new online "portal" to provide access to a variety of rip current information, including daily forecasts for various shorelines around the country. Web surfers can get general information on the homepage, or can plug in a town name or zip code to see if the weather service provides forecasts for that location.

www.usla.org

The U.S. Lifesaving Association is another source of information on water safety issues. "A rip current is not an 'undertow' — it will not pull you under," explains the USLA site on the Web.

www.nps.gov/indu/rip.htm

Rip currents are not exclusive to the oceanfront. They are also found in the Great Lakes and the Gulf of Mexico. The National Park Service explains rip currents are found along Lake Michigan.

Hurricane Resistance:

Retrofitting, Storm Shutters Increase Safety

By Ann Green

When the next warning goes out for a hurricane in Wilmington, Spencer Rogers won't have to worry about boarding up his windows.

His new plywood storm shutters will keep flying debris from shattering his windows — and the shutters are easy to install.

"Plywood storm shutters that protect windows during hurricanes have been in use for many years and are one of the most cost-effective ways to build shutters," says Rogers, North Carolina Sea Grant's coastal construction and erosion specialist.

"Storm shutters may not be the highest priority for hurricane retrofitting. But as the wind-resistance of a building is improved, shutters become a top priority in high-wind zones. For some homes, threatening sources of debris may make shutters the first priority."

Rogers says shutters prevent wind-blown rain from going through a broken window.

They also prevent the "increased internal pressure on the building that results from any large opening, such as a broken window on an upwind wall," he adds.

Rogers worked with South Carolina Sea Grant, Clemson University and Blue Sky Foundation in Raleigh to test the new shutter design.

Rogers' shutters are a prototype of a design that, after prefitting, can be installed from the inside of the home without a ladder — even on a second story.

For easier installation before a storm hits, Rogers recommends precutting the panels to size, attaching permanent fasteners on the house and storing the panels.

Even if the plywood shutters are preinstalled, it can be hard work to put them in before the storm, says Rogers. "It is particularly difficult when a ladder is needed for installation," he adds. "Gusty winds and heavy rains can make ladder work even more dangerous."

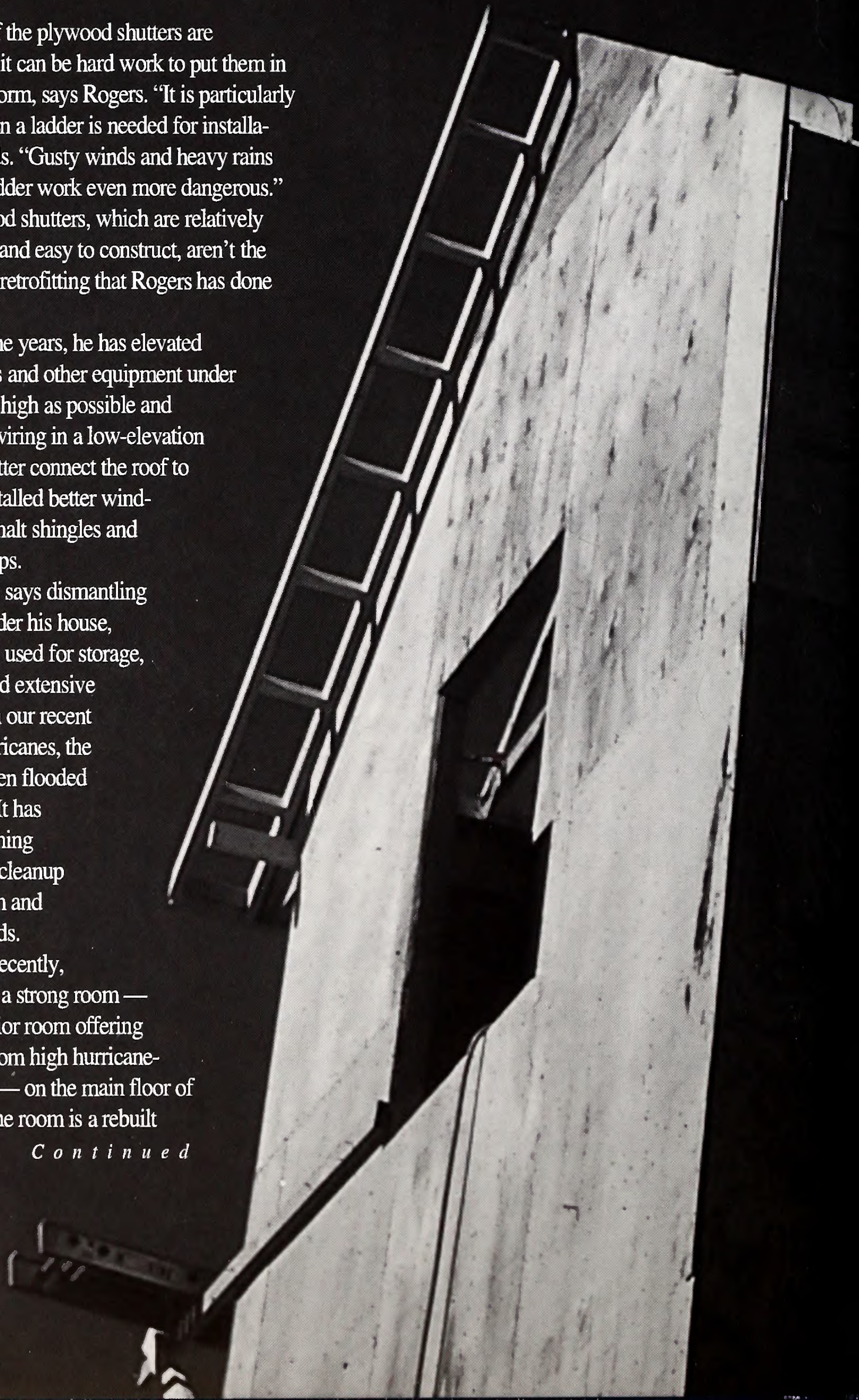
Plywood shutters, which are relatively inexpensive and easy to construct, aren't the only type of retrofitting that Rogers has done at his home.

Over the years, he has elevated water pumps and other equipment under the house as high as possible and dismantled wiring in a low-elevation room. To better connect the roof to walls, he installed better wind-resistant asphalt shingles and hurricane clips.

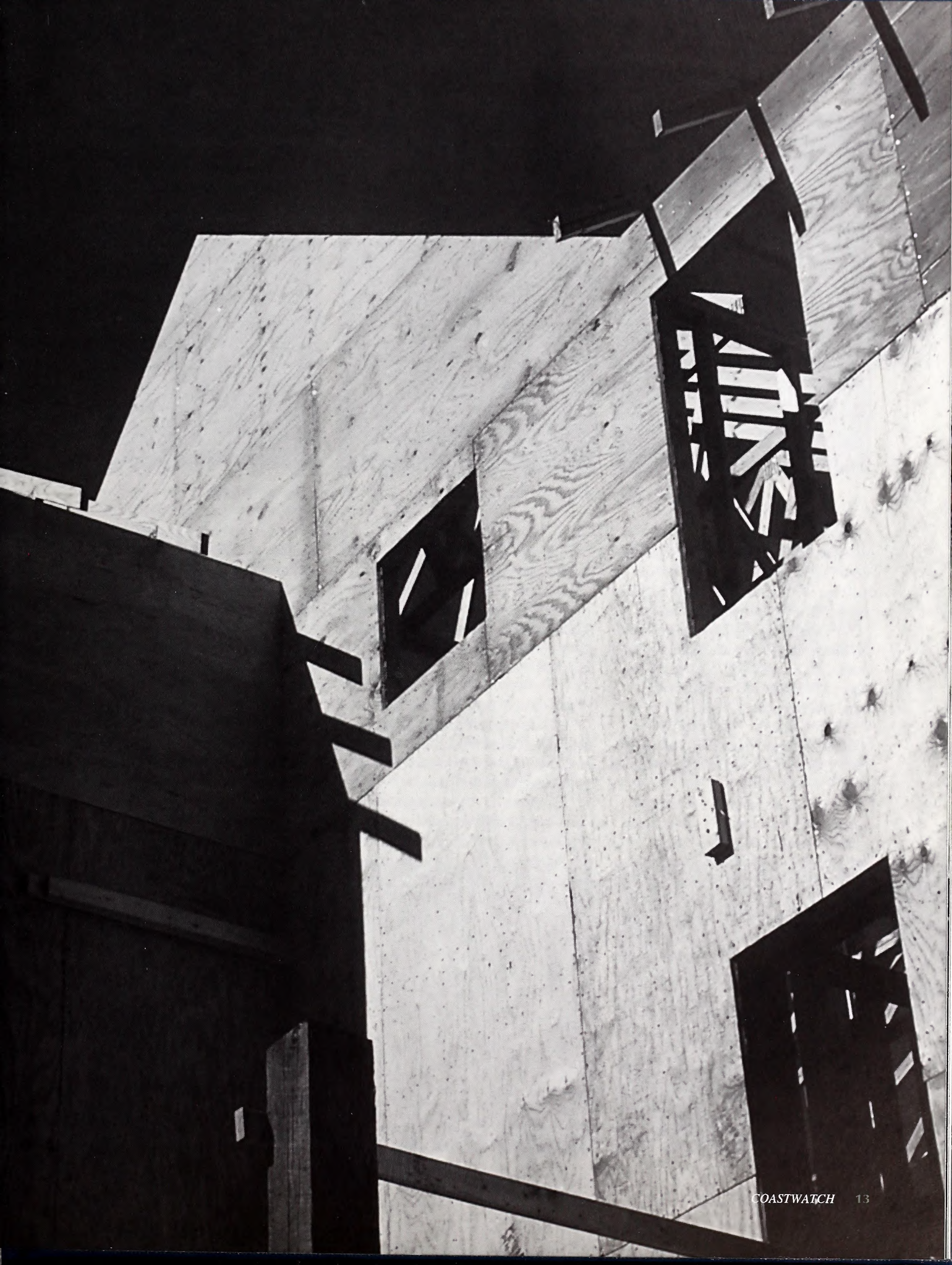
Rogers says dismantling the room under his house, which is still used for storage, has prevented extensive flooding. "In our recent binge of hurricanes, the room has been flooded three times. It has required nothing more than a cleanup with a broom and hose," he adds.

More recently, Rogers built a strong room — a small interior room offering protection from high hurricane-force winds — on the main floor of his home. The room is a rebuilt

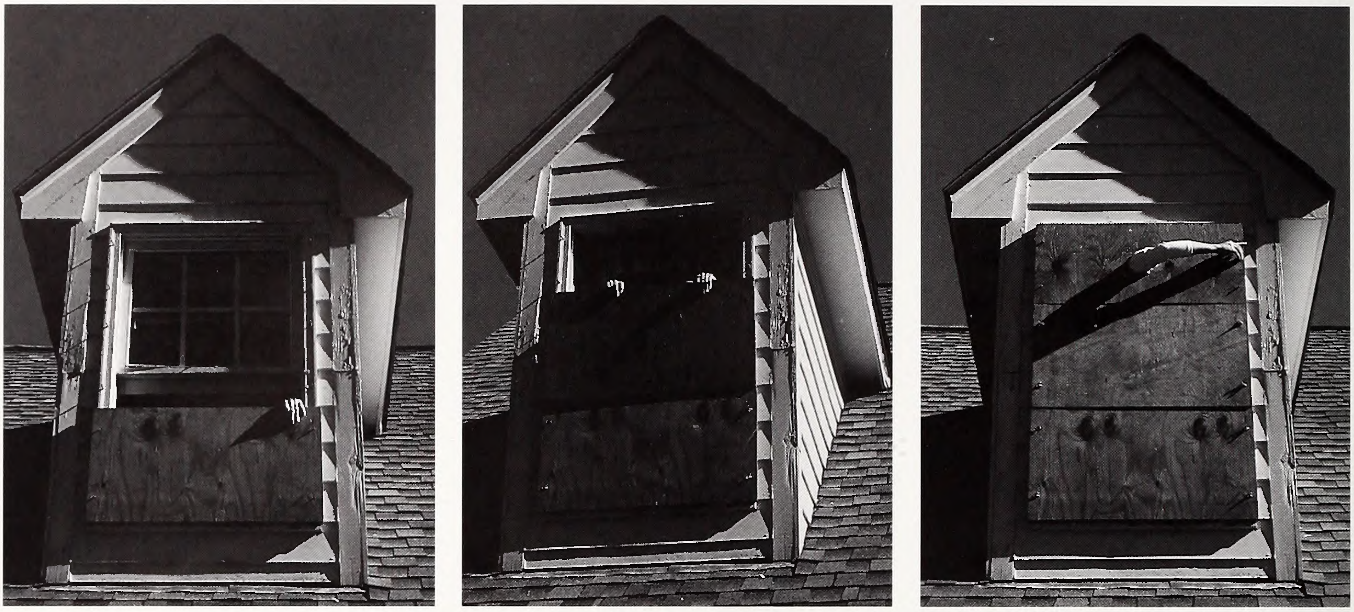
Continued



Scott D. Taylor



Photos by Scott D. Taylor



After prefitting, plywood shutters can be installed from the inside of a home.

closet under the stairs in the center of the house. Rogers added three layers of plywood to the walls and ceiling and two layers to the door. He also reinforced the door hinges and latches.

"During the worst winds of the five most recent hurricanes that hit Wilmington, my family huddled in a central hallway of my home," says Rogers. "Although I never felt that our lives were threatened or that we should have evacuated to another building, it became apparent that the added assurance of a strong room would add peace of mind should we get hit again."

Wilmington's wind risk from hurricanes is significantly lower than the extreme tornado winds — more than 200 mph — used for national "safe" standards. Thus, Rogers chose a strong room design developed and tested at Clemson. The room has an estimated capacity of about 60 percent of the national standard for safe rooms designed for the worst tornados.

Rogers emphasizes that no single technique is right for making everyone's home safer during a hurricane.

"The hurricane resistance of many homes can be substantially improved using a variety of techniques to reduce the chance of structural damage and damage from wind-blown water or flood water," says Rogers. "Each house is different. What matters is finding the weakest components and looking for the most cost-effective priorities for each house."

The best — and least expensive — way to make a building storm-resistant is to modify it while it is under construction, says Rogers.

"It is much easier and more reliable to do a brand new house if you want a higher standard for wind resistance than retrofitting an old house," he says.

Wind-Resistant Materials

Decades of experience support Rogers' advice. Over the last 27 years, he's surveyed the structural damage from major hurricanes that have hit the East and Gulf coasts.

He says the key to preventing structural wind damage from hurricanes is connections.

To prevent structural damage, strengthen each separate connection between the top of the roof and the foundation. It is critical to prevent water from penetrating through exterior siding, roof coverings, wall sheathing, windows, vents and doors.

"It is not the board that breaks in a hurricane," says Rogers. "It's what holds the boards together — usually a nail or a screw. It's critically important that everything be strongly tied together."

Likewise, buildings don't simply blow over in the wind, he says. Inadequate connections and the wind's forces of uplift often cause the damage.

Wind-uplift forces cause airplanes to fly, and the same principle applies to roofs. When a high-speed wind blows across a low- to moderately sloped roof, it creates a lift. The roof pulls off when the lift force exceeds the roof's weight plus the capacity of its connections to the walls. Without the roof, the walls collapse.

Homeowners can counter the problem by working from the top down, making sure the roofing is well-attached to the sheathing, the sheathing to the roof framing, framing to the walls, and the walls to the floors — all the way down to the foundation.

Rogers advises using metal straps or hurricane clips rather than nails alone to secure the roof.

"Straps change the direction that nails are pulled and make any nail used 10 times stronger than typical toenailing," he says. "You also need to make sure each connection is tied to something lower. The higher the elevation of the connection in the building generally, the more important it becomes. The lower you go in the building with the connections, the heavier the sum of the parts for the connection."

One way to strengthen connections between the wall and roof in existing homes is to use a retrofit bracket developed by Clemson researchers Tim Reinhold and Ed Sutt.

The structural bracket can be installed from the inside of the room without removing sheetrock. Once installed, the system is hidden by molding.

To install the roof on a new 2,400-square foot home at Carolina Beach, builder Michael Hogan glued down the roof, screwed it, and then used self-adhering tape on the roof deck seams for a secondary water barrier.

"It cost about $500 extra to do this," says Hogan. "It makes the roof a lot stronger."

Below the roof, windows and doors are also important to maintaining the integrity of the building envelope — they need to be strong and well attached. French and sliding-glass doors — with wide spans and poor connections in the middle — can be vulnerable to strong wind. And large picture windows are often not strong enough to survive fierce storms.

Another troublesome spot is the garage.

It is important to use garage doors with extra bracing and heavier tracks designed for high wind resistance. "The garage is one of the weakest points in the house for lateral wind forces," says Rogers. "The consequences of a door failure can be even more of a structural threat than a loss of a window elsewhere in the house."

Last summer, Clemson researchers used everything from high-tech crowbars to a huge crane to "test to destruction" houses that were outfitted with hurricane-resistant retrofits. They first tested houses as they were built without any hurricane-resistant features and then retrofitted the houses with hurricane-resistant features.

The homes in Horry County, S.C., all had been damaged by floods in Hurricane Floyd and were slated for destruction. South Carolina and North Carolina Sea Grant programs were involved in the project.

Retrofits for connecting the sheathing to the roof framing made a "significant improvement in the roof connection uplift performance," says Reinhold.

However, there were a few surprises. In two cases, the rafters split before the roof connection failed, according to a report. "This is an indicator that building code standards have been improving, with lessons learned from building performance in previous storms," he adds.

The researchers also tested the homes' resistance to flying debris by shooting wooden two-by-fours from an air cannon.

Flood Damage

Buildings most often are destroyed by waves and erosion that accompany storm-induced floods. Erosion causes structures to collapse, and the power of even small waves can pound a home into pieces. Research has shown that a 1.5-foot or higher breaking wave can easily destroy a well-built house designed for 120-mph winds, Rogers says.

The remedies are an open piling foundation and a high floor elevation. Piling foundations on oceanfront homes must extend to at least 5 feet below sea level so that waves can go through them unimpeded.

North Carolina has the second-oldest hurricane construction codes in the country, first implemented in the 1960s and improved over time.

The first test of the latest foundation standards came with Hurricane Fran in 1996, which brought storm surges up to 11 feet and coastal winds of more than 100 mph.

Of the 205 new Topsail Island structures built after the piling foundation standards set in 1986, 200 buildings survived — while 180 oceanfront buildings on the island that were built on shallower pilings were destroyed by erosion, Rogers notes. It is suspected that the five newer buildings lost were not in compliance with the 1986 code.

At Carolina Beach, oceanfront structures are required to have 26-foot pilings — 16 feet in the ground and 10 feet out of the ground. Waterfront structures require 20-foot pilings — 10 feet in the ground and 10 feet out of the ground.

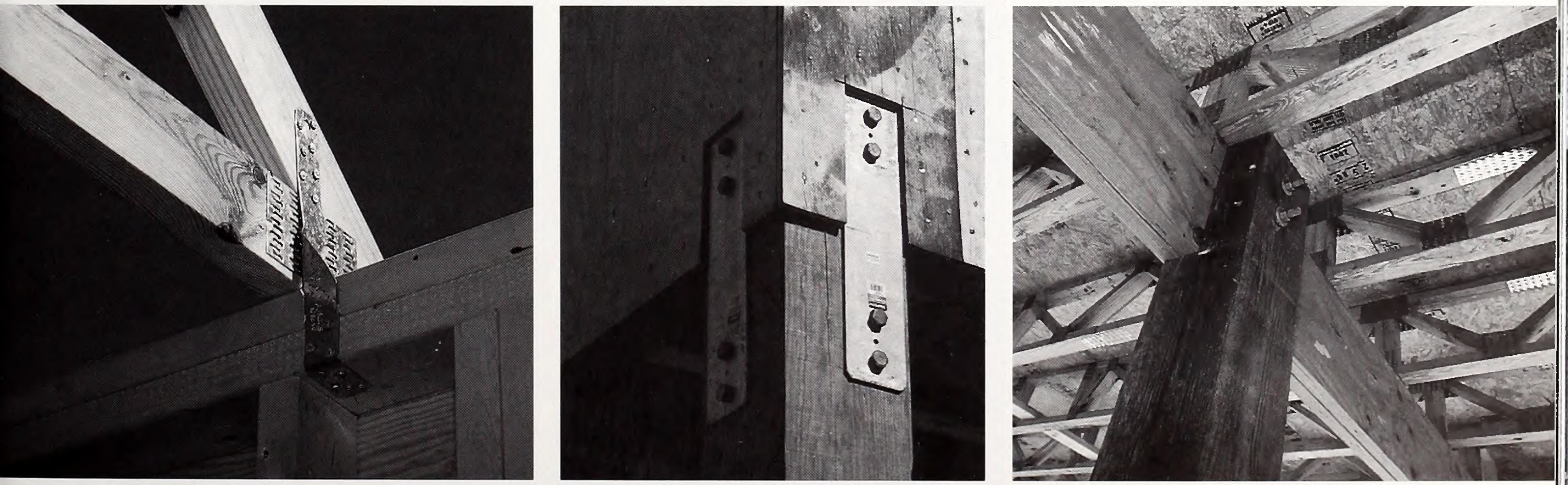
To go beyond code and make a stronger foundation, Hogan installed the pilings six feet deeper than required — to 16 feet in the ground — in one waterfront home.

"It costs about $10 a foot for piling installation," says Hogan.

Existing buildings also can be retrofitted to prevent flood damage. After Hurricane Emily in 1993, more than 50 Outer Banks homeowners raised their houses by 2 to 10 feet, Rogers says.

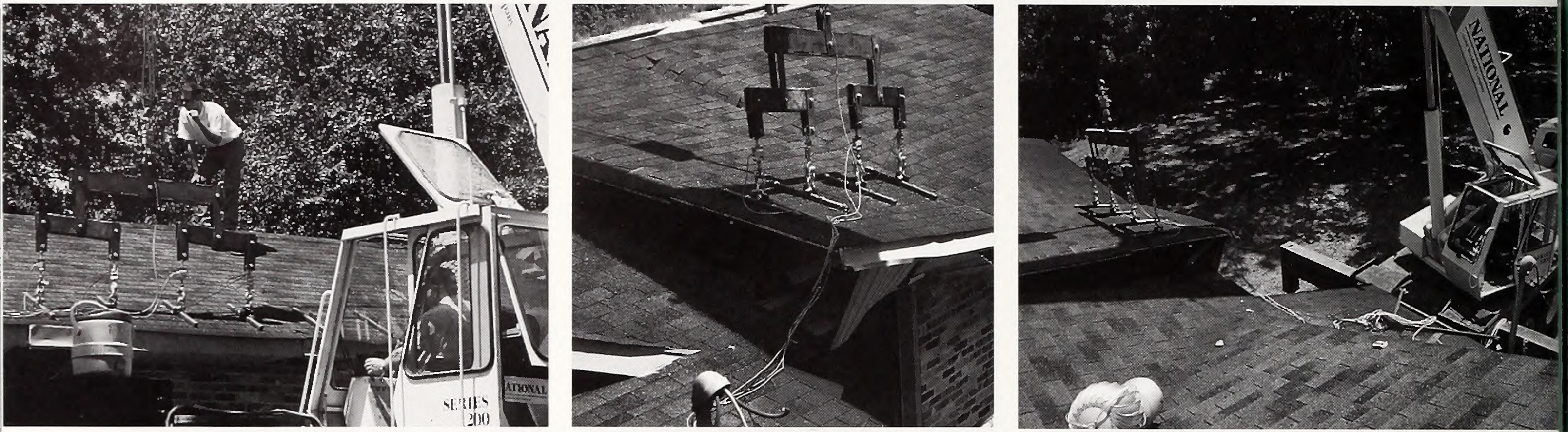
Continued

Hurricane clips or metal straps help strengthen the connections between the wall and roof in new or existing homes.



Photos by Scott D. Taylor

Photos by Spencer Rogers



Clemson University researchers used a huge crane and other equipment to "test to destruction" a Horry County, S.C., home that was flood-damaged by Hurricane Floyd.

They did this because they'd been flooded as many as three times in the previous 10 years. The costs averaged $11,000 to $15,000 per house.

Most of the expense comes in replacing the foundation and extending connections for sewer and utilities. The higher elevation gives the owner new space under the building for storage or parking.

An option is to move low-elevation utilities such as electrical outlets and switches that would short out and interrupt power to the rest of the house if they were flooded. An electrician can remove them and install them at higher elevations. When equipment or appliances wear out — air conditioners, water heaters and heat pumps — you have an opportunity to raise the elevation to prevent damage, Rogers suggests.

New N.C. Program

In Florida, the Institute for Business & Home Safety (IBHS) has initiated a program of optional upgrades called "Fortified for Safer Living." The partners include the National Network of Building Inspectors & Engineers, the Blue Sky Foundation and the Florida Alliance for Safe Homes.

These new homes are adapted to high winds, flooding and wildfires. The homes include peril-resistant criteria that go beyond the minimum requirements of local codes — from protection of all openings and a secondary moisture barrier on roofs to wind-resistant roofing and specified fasteners on thicker, plywood sheathing.

So far, five fortified homes have been built in the Tampa-St. Petersburg area.

"It is a prescriptive program," says IBHS fortified program manager Chuck Vance. "There is nothing unusual about our program. It follows basic coastal regulations and Federal Emergency Management recommendations."

If a hurricane strikes the Tampa-St. Petersburg area, the five fortified homes can be used as a comparison to existing homes, says Vance.

IBHS is extending the fortified program to North Carolina and other states.

"We are looking to work with builders and emergency management officials," says Vance. "We chose North Carolina because it is a progressive state that has suffered from a lot of natural disasters and is ready for the program." ◘

RETROFITTING RESOURCES

When deciding on retrofitting options for your home, there are many available resources.

Clemson University and South Carolina Sea Grant researchers are designing a strong room that can be retrofitted into existing buildings. Soon, a detailed description about the new strong room will be published. Because the strong room does not meet a recently approved national standard for worst-case tornado storms, it is not cost-effective for new construction, according to Spencer Rogers, North Carolina Sea Grant's coastal construction and erosion specialist.

If you want to install plywood storm shutters, researchers from South Carolina and North Carolina Sea Grant, Clemson and the Blue Sky Foundation have designed a new type of shutter that can be installed from the inside. The shutters must be prefitted. Use a ladder to install the permanent attachments for the shutters. Later this year, a brochure will be available on the new storm shutters.

For more information about retrofitting, contact Spencer Rogers, 910/962-2491, or **rogerssp@uncwil.edu**.

Following are some Web sites with retrofitting information:

North Carolina Sea Grant, **www.ncsu.edu/seagrant**. Follow the extension links to coastal construction.

South Carolina Sea Grant, **www.scseagrant.org**. Follow the links to extension and coastal hazards.

Sea Grant's HazNet, **www.haznet.org**.

Clemson University's Wind Load Test facility, **www.ce.clemson.edu**. Follow the links to research and structural geotechnical.

Blue Sky Foundation, **www.bluesky-foundation.com**.

Institute for Business & Home Safety, **www.ibhs.org**.

— A.G.

THE COASTAL SOCIETY:

THE WHOLE IS GREATER THAN THE SUM OF ITS PARTS

By Pam Smith

When it comes to The Coastal Society, the whole is greater than the sum of its parts, according to Walter Clark.

North Carolina Sea Grant's coastal law and policy specialist, Clark is at the helm of the international organization founded 25 years ago to address emerging marine and coastal issues.

The strength of TCS, he believes, rests with its 300-plus members — a diverse group of professionals representing academia, government, the nonprofit arena and the private sector. In other words, the dedicated women and men who are "in the trenches" dealing with coastal change on a daily basis.

"TCS is small enough to be effective, but large enough to have a voice that can be heard above the confusion of issues," Clark maintains.

Perhaps, TCS is more relevant and more important today than ever before, he says. "In the past 25 years, the pressure on the coastal and marine environment did nothing but increase. A huge percentage of the world's population is clustered in coastal zones. With that goes increased resource pressures and increased user conflicts. And, with that also goes a necessity for collaboration among citizens, agencies, local governments and nations."

Continued

Scott D. Taylor

Walter Clark, right, discusses beach policy with a workshop participant. Clark, North Carolina Sea Grant coastal law and policy specialist, is current president of The Coastal Society.

Clark explains that TCS has a reputation for being proactive by bringing new information to the table and providing a forum for discussion and debate. One such forum is the biennial TCS conference — designed as a venue to exchange information, cross-pollinate ideas and develop strategies.

The information, ideas and strategies are exponentially multiplied as members test them in their real-world settings, Clark says.

That momentum has kept TCS viable through the years, he adds. It also supports a premise espoused by Clark: "As long as there is time and energy, we can influence results — often for the common good."

The North Carolina Connection

Clark shares the TCS leadership legacy with other North Carolinians with Sea Grant ties. The roster of TCS past presidents includes:

- William A. Queen, director of the Institute for Coastal and Marine Resources at East Carolina University, TCS president 1988-1989;
- Lauriston R. King, director of the doctoral program in coastal resource management at East Carolina University, TCS president 1989-1990; and
- Michael K. Orbach, director of the Duke University Marine Laboratory in Beaufort, TCS president 1996-1997.

Queen joined TCS during its start-up years. He was impressed with the interdisciplinary character of the fledgling organization.

"Problems are best solved by people from different disciplines learning to work together to share information and reach conclusions," Queen says. "Almost any topic, from offshore drilling to estuarine water quality, must take a diversity of interests into consideration — the natural environment, coastal processes, socio-economic and political dimensions."

His own research bears an interdisciplinary hallmark, including estuarine science/public policy studies he conducted for various state agencies. Since 1979, Queen has administered an important segment of Sea Grant extension activities here.

King, who served as deputy director of Texas Sea Grant from 1978 to 1987, says TCS was one of the first professional organizations where that message was truly understood.

"People became interested in TCS when they recognized that you can't address an issue unless you bring all areas to bear on the topic," he adds.

King recalls the late 1960s, when the U.S. was in a science race against the Russians. There was an attitude in many government agencies that doing "hard" science was the end all and be all. He waged an uphill battle advocating the integration of social science.

> The strength of TCS rests with its 300-plus members — a diverse group of professionals representing academia, government, the nonprofit arena and the private sector. In other words, the dedicated women and men who are "in the trenches" dealing with coastal change on a daily basis.

Orbach, too, remembers the TCS launch as an extension of other events at the national level.

"In 1976 the National Oceanic and Atmospheric Administration was charged with implementing the National Marine Fisheries Act. They recognized that a social scientist was needed to help take the human element into account," Orbach explains. He became first social science advisor for both NOAA and the National Sea Grant Program.

He repeats King's views that the decision-making process needs both science and social science in the decision-making equation. Social scientists study how people govern themselves, he says. "You can't just study the fish in the water, you have study the human in the community," he asserts.

Orbach says it boils down to this: "When you make political decisions regarding natural resources, you are not changing the behavior of nature. You are attempting to change the behavior of people. Decisions are based on human values — how people want the environment to be. So, necessarily, resource management is people management."

Pam Smith

William Queen, left, and Lauriston King, right, are both past presidents of the Coastal Society. Both are at East Carolina University.

As TCS president, Orbach left an important mark — how to train professional coastal environment managers to take science and put it into the public policy arena.

Orbach also left a mark on state policy with a major Sea Grant study in 1996, "Effort Management in North Carolina Fisheries: A Total Systems Approach." It was an important piece of the report of the Fisheries Moratorium Steering Committee to the North Carolina General Assembly later that year.

He predicts an integrated coastal management model will be key to implementing coastal and ocean policies for the next century.

An Evolving Story

Clark says that the TCS future rests on a strong foundation laid down in an era of social change and environmental awareness. The 1960s launched the Stratton Commission to look at the nation's use of oceans. The Coastal Zone Management Act, the National Marine Fisheries Act, the Marine Mammal Protection Act and the Clean Water Act, NOAA and the National Sea Grant network emerged from the commission's 100 recommendations.

TCS was forged by a handful of people from across the country who were working in newly established federal and state programs, recalls Marc Hershman, director of the School of Marine Affairs at the University of Washington. Hershman served as TCS president 1980-1981 and is a member of the U.S. Commission on Ocean Policy.

"There also were recent grads from the emerging marine affairs programs, faculty and members of public interests and environmental organizations," Hershman says.

"Early on, we had to decide if we were oriented to research and information generation, activism, public education — or some other approach. Typical of young organizations, we didn't make a hard decision, but assumed that we would have broad appeal. There have always been grand dreams that TCS would be a 'think tank,' a policy forum, a job fair, etc."

He credits Margaret Davidson, director of NOAA's Coastal Services Center and former South Carolina Sea Grant director, with establishing a forum for land-use and property rights issues.

"Orbach took the time to push us toward thinking about ourselves as an emerging profession with particular standards and specialties. And Tom Bigford spent much time upgrading the TCS *Bulletin*," says Hershman.

Bigford, who directs the NOAA/NMFS Habitat Protection Division, served as *Bulletin* editor for 17 years.

Though he has been on the TCS board in various capacities, Bigford is proudest to have been a prime mover behind the student awards for papers at the biennial conference. Student members of TCS chapters at ECU, Duke and the University of Washington make poster and paper presentations at special conference sessions.

"The student award is named for me, and gives me a chance every two years to convince folks that I am still alive," Bigford jokes.

Bigford believes the next generation of coastal managers will benefit from the collective experience of a diverse TCS membership. "Members represent a cross-section of coastal fields from students to professionals, from conservation to development, biology to engineering, teaching to library science. They are from U.S. coasts and overseas," he says.

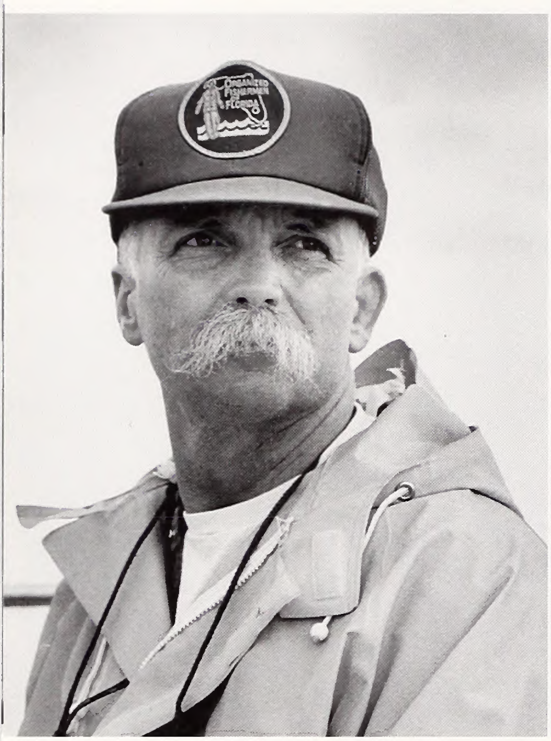
There's much to be said for the TCS networking. Even after nearly three decades in his field, he says, "Habitat is a common integrator among scientists, fishery managers, the private sectors and the public. Networking is important in this field. I have used my volunteer work with The Coastal Society and my professional career with NOAA to weave several networks."

Bigford says the role of TCS is to educate and communicate, to share information and to encourage deeper thought about how the nation uses its coastal resources.

Coastal management challenges include grappling with ecosystem-based approaches to fishery management, burgeoning port and harbor development, and environmentally sound aquaculture, he says.

Somewhat tongue-in-cheek, Bigford adds, "And, balancing uses in Marine Protected Areas

Continued


Scott D. Taylor

Michael Orbach of the Duke University Marine Lab brought a social science perspective to early NOAA efforts.

to meet the public's expectations to do all things faster, cheaper and more effectively with the latest technology."

Robert F. Goodwin, coastal services specialist with Washington Sea Grant, is president of the TCS Cascadia Regional Chapter — the first regional chapter.

"TCS is thriving and growing both here and nationally. We have a new student chapter at the University of Washington, modeled after the one at Duke. That speaks to the interest of the next generation of coastal managers in sustaining a vital international professional organization."

Goodwin adds, "TCS is the only membership organization that serves the interests of the coastal management academic, practitioner and involved citizens — and builds bridges among them, celebrates their successes, and honors their leaders. TCS is a true coastal fellowship that has sustained the spirit of the Coastal Zone Management Act through some dauntingly adverse political periods over the past quarter century."

A Holistic Future

The 2002 TCS conference, "Converging Currents: Science, Culture and Policy at the Coast," (May 19-22) is being played out against the backdrop of prospective change. As members gather in Galveston, the U.S. Commission on Ocean Policy continues a series of national meetings that could set the agenda for the 21st-century ocean policy. At the same time, the Pew Oceans Commission, created by the Pew Charitable Trust, is completing a series of national studies on a litany of coastal and marine topics.

TCS members expect to hear from the U.S. Commission on Ocean Policy. And, likewise, Clark is hopeful that members of the commission might learn some things from the TCS approach to regional problem-solving.

"We'll be examining the scientific and management challenges of the Gulf of Mexico," Clark notes. "The Gulf is a semi-closed body of water that touches many countries and jurisdictions. We'll have a chance to hear about what they are doing that could become a model in other regions, especially related to governance issues."

Sessions are to focus on regional approaches to ecosystem-based management, including physical, ecological, cultural, political and economic perspectives.

The conference as a whole is a time and place to synthesize a host of issues, Clark says. "It brings together a lot of good minds into one forum for sharing good work from specialized sciences."

Discussion topics include strategies for addressing issues at the land-water interface, as well as post-Sept.11 security issues for ports and harbors. As expected, North Carolina will be well represented at the table.

ECU's King leads a panel attempting to shed light on "Understanding Change, Designing Coastal Policy." The panel considers the changes and their impacts on social and natural resources.

"Population change is short-hand for increased pressures on the coast and its resources. ... But demography is not destiny," King says.

Jack Thigpen, North Carolina Sea Grant extension director and coastal communities specialist, is part of the panel. He targets coastal land-use planners, government agencies and those charged with decision making.

Not surprising, King and Thigpen are collaborating on a Sea Grant-funded project looking at policy issues that local communities tackle, especially those involving coastal resource issues. While the focus is on North Carolina coastal communities, they hope the project will aid other states in managing growth challenges.

In another TCS presentation, King outlines a framework for understanding the political context within which fisheries managers must work. He recommends training strategies for prospective coastal resources managers.

The 2002 TCS conference, "Converging Currents: Science, Culture and Policy at the Coast," (May 19-22) is being played out against the backdrop of prospective change. As members gather in Galveston, the U.S. Commission on Ocean Policy continues a series of national meetings that could set the agenda for the 21st century ocean policy. At the same time, the Pew Oceans Commission, created by the Pew Charitable Trust, is completing a series of national studies on a litany of coastal and marine topics.

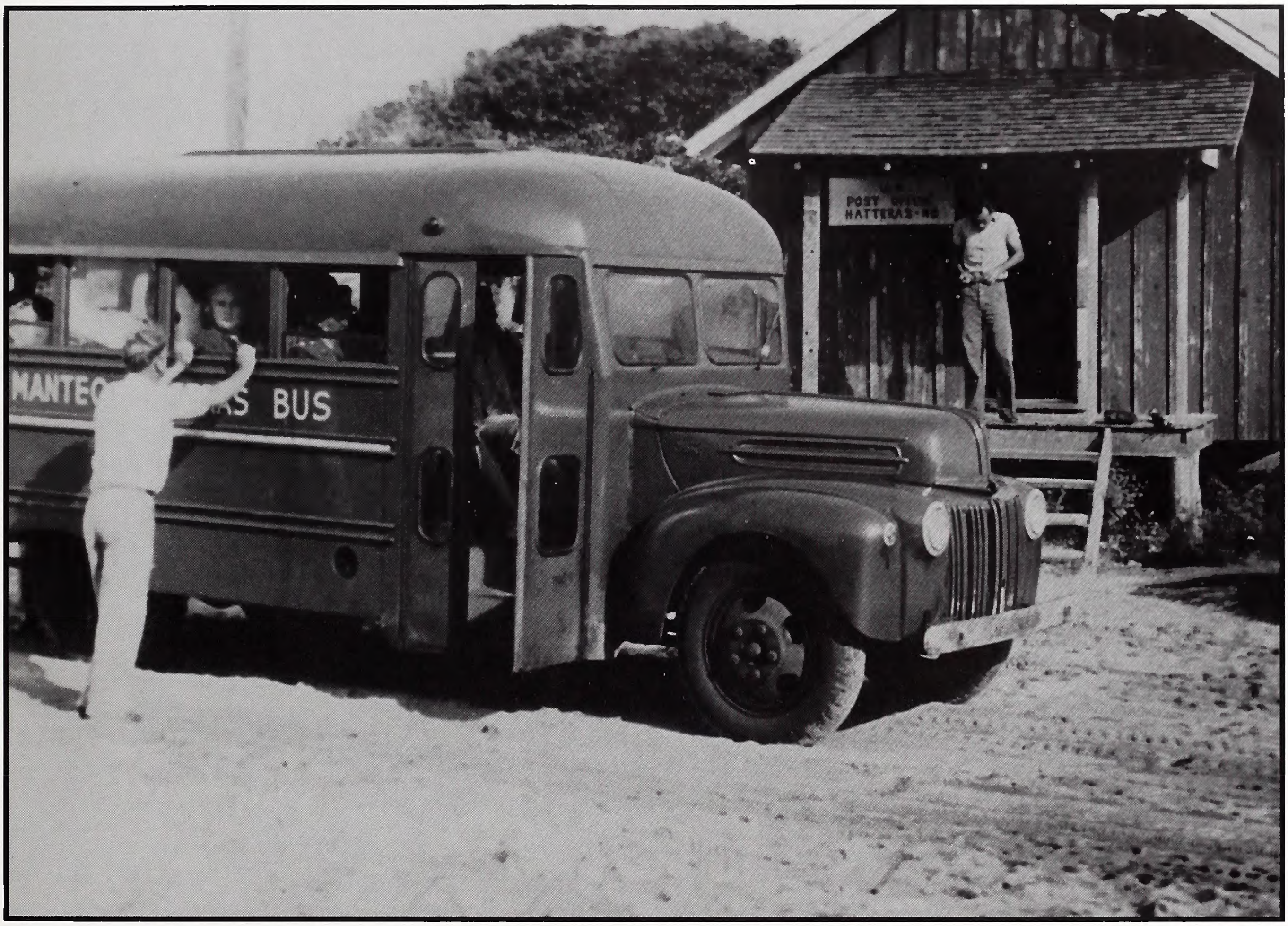
In other words, TCS members don't stop at stating obvious problems, but rather they offer solutions.

Clark is optimistic about the future of coastal and ocean stewardship.

He says his optimism is not unfounded. "It's not all doom and gloom out there," Clark says. "It may seem like the problems are insurmountable, but look at history. Since the 1970s, the state of the environment and the quality of coastal waters have improved."

He's hedging his bet on holistic, integrated management. "It holds the key to wise stewardship of our coastal and marine environments. We've got to understand the relationship between human action and environmental response — and to learn how to effectively guide our activities. We are, in effect, the trustees of the environment.

"Like TCS, collective environmental stewardship is greater than the sum of its parts," says Clark.



The Midgett brothers' bus line stopped at the sandy road in front of the old post office in Hatteras. The bus was usually crowded with residents and tourists, as shown in this 1946 photo.

Photo courtesy of the Outer Banks History Center

MIDGETT BROTHERS:

'Wildest Bus Ride' on Hatteras Island

By Ann Green

For almost 25 years, the Midgett clan on Hatteras Island operated a "rough and tough, sea-going bus line," in the words of Stocky Midgett. "Some passengers called it the wildest bus ride in America," says Stocky. "The drivers were from 14 to 16 years old."

Stocky and his brothers Anderson and Harold Midgett drove the buses as teen-agers in the late 1930s and early 1940s. Because there were no paved roads on the island, the bus service was a necessity for residents.

Continued

"I sat on a pillow so I could see over the wheel," says Stocky.

The brothers cruised through surf and bounced over hard-packed sand on their route from Hatteras to Manteo. On a lot of days, they got stuck in the sand.

"Once, we lost a bus on the beach near a shipwreck," Anderson says while looking at an old photo of a bus. "We would have been better off losing it. It filled up with sand."

The next day, the bus was pulled out of the sand.

During bad weather, the brothers had lots of problems, says Anderson.

"It took a lot of time to go through sea water," he says. "The worst hurricane was in 1944 and had no name. It cut about four or five inlets on the beach."

During a northeaster in 1954, the bus sunk in "quicksand" on the highway two miles south of Oregon Inlet, according to Stocky. "It did an estimated $15,000 of damage to the bus," he adds.

Transportation Pioneers

The bus line — begun in 1938 by Anderson, Harold and Stocky's late father, Theodore Stockton Midgett — was the first public transportation system on Hatteras Island.

"Right after my father started the busline, he died," says Anderson. "It was left for my mother and the boys to carry on."

During the early years, there were no paved roads. "We drove on the beach or sand road," says Anderson. "We made our own roads. We had 101 different roads."

For example, south of Avon, they rode on wooden planks over a dike just past a hunting club.

About 90 percent of the island's residents rode the bus before the island road was paved, says Stocky.

During the 1950s, the N.C. Department of Transportation began building roads on the island. "The roads were built in segments," says Stocky.

The Midgetts operated the line until 1963, when they sold it to Virginia Dare Transportation. "It was not profitable," says Stocky. "It was too expensive. Then the roads came."

Michael Halminski

Anderson and Stocky Midgett still take beach rides.

After that, Anderson and Stockton started Midgett Realty. They also built the Hatteras Marlin Motel in 1963. Today, Anderson and Stocky work out of offices at the Marlin Motel filled with photos of the bus lines.

"Sometimes, I wonder how we did it and survived," says Anderson. "All of us had a lot of experience driving in the sand. We could pretty well drive anywhere on the beach. We tried to use the biggest tires we could. After the war, we tried a four-wheel command car from the Army. But the Army surplus vehicle didn't work well. Most of our buses were Ford buses."

Crowded Vehicles

During the early years, they drove a green 1938 Ford "woody wagon."

"We could haul up to nine people in that wagon," says Stocky.

The wagon would get so crowded that people had to sit in each others' laps, according to Jack Goodwin, Carteret County Historical Society librarian. He says one of the memorable trips was after a revival led by a "child prodigy."

"It was so crowded that the evangelist had to sit in my lap," says Goodwin. "I could see her wrinkles and heavy makeup and feel her corset. There was no way she was just 12 years old."

Over the years, the Midgetts operated a variety of vehicles. The most famous and unusual was a Ford truck called the "old blue goose." The vehicle's body was built in Philadelphia, and the seats were arranged along the vehicle's sides as well as in rows.

During later years, they transported passengers in school buses.

"Over a period of years, we probably had 50 different vehicles," says Anderson. "In our busiest times, we had six buses going back and forth. We would haul as many as 40 people a day."

With the buses, the Midgett brothers made a daily trip to Manteo, with stops in Frisco, Buxton, Avon, Waves and Rodanthe.

"We picked up people from Whalebone Junction in Manteo and charged about $2.50 per person," says Anderson. "If someone was from Rodanthe, we charged as little as $1.50."

Often, they stopped in Rodanthe to get an Orange Crush or pack of Nabs at their mother's store. "This was our rest stop," says Stocky. "We would stay there 10 or 15 minutes."

To cross Oregon Inlet, they rode a ferry. Capt. Toby Tillett operated the ferry until the Herbert C. Bonner Bridge was completed in 1963.

"Oregon Inlet was wider then," says Stocky. "The ferry took 30 minutes to cross the inlet."

Once the bus reached land, they drove on a dirt road into Whalebone. "The only highway was from Whalebone into Manteo," adds Stocky.

The buses carried tourists and local residents and delivered packages and groceries.

"We picked up everything for people — mail, laundry, packages and prescriptions," says Stocky's wife, Elizabeth Midgett. "If you wanted a pair of hose, we would go get it."

When the Midgetts sold their bus line, they didn't quit driving on the beach. Stocky still drives his Ford F-150 truck on the beach regularly.

"I love driving on the beach and going fishing," he says. "It is a part of my life."

As he drives down the beach in his truck near Hatteras Inlet, Stocky has a vivid memory of his bus driving days.

"There were 101 different routes," he says. "Sometimes, we rode on the banks. It depended on where the tide was."

But no matter where they went, "the ride was beautiful," he adds. ▣

Researchers used whole fish for the ozone study.

Researchers Find New Use for Ozone

By Ann Green • Photographs by Scott D. Taylor

Continued

TOP: A Hanover Sea Products employee prepares some fish fillets on a table that was sanitized with ozone. BOTTOM: Ozone can be used as a broad-use sanitizing agent.

For many years, scientists have known that ozone high in the atmosphere protects humans from the harmful ultraviolet rays of the sun.

But the powerful oxidant could have another benefit on earth — enhancing the freshness of raw seafood.

Recently, scientists from the North Carolina State University Seafood Laboratory in Morehead City discovered that ozone reduced the population of common spoilage bacteria in seafood processing facilities. The researchers worked with Peter Mairs of Hanover Sea Products in Wilmington.

The study, funded by the N.C. Fishery Resource Grant Program (FRG), found that treating raw fish and processing equipment with ozone greatly reduced the number of bacteria that could potentially spoil seafood, according to Barry Nash, North Carolina Sea Grant seafood technology and marketing specialist. The FRG program, funded by the N.C. General Assembly and administered by North Carolina Sea Grant, supports projects for seafood processors and others in the seafood and fishing industries.

Ozone also enhanced the freshness of raw fish during refrigerated storage, according to study results.

"We demonstrated the potential effectiveness of ozone as a broad-use, sanitizing agent in a seafood production facility," says Nash.

"This is important because bacteria are everywhere in the environment. However, the use of ozone could greatly reduce the number of spoilage bacteria in a seafood plant and help maintain low levels of spoilage bacteria over time in air, water and on processing equipment," he adds.

Researchers also found that ozone seemed to improve the shelf life of uncooked fish.

"Ozone extended the shelf life of our treated fish by one or two days," says Barbara Blakistone, one of the project's investigators and a packaging consultant. "That is important when dealing with fresh fish. Ozone could help enhance product quality and lengthen the shelf life of fish so that seafood lasts longer in the retail or wholesale distribution chain."

What's more, ozone did not alter the appearance, color or aroma of the fresh fish, says Nash. "So the sensory characteristics of the treated fish were not affected."

There were other benefits from treating air and water with ozone at the Wilmington seafood processing facility, where the research was conducted.

"Ozone is immediately lethal to bacteria," says Nash. "Our qualitative results showed that ozone caused a marked and sustained decrease in air- and water-borne bacteria. This has important implications for minimizing bacterial cross-contamination in the workplace environment.

"If the population of spoilage bacteria in a plant can be quickly reduced and maintained at low levels on both seafood and processing equipment, the ultimate benefit to processors could be an extension in shelf life for a highly perishable food product such as fresh fish."

Other Advantages

Robb Mairs, general manager of Hanover Sea Products, finds the results promising for seafood dealers.

By extending the shelf life, seafood dealers can reduce the amount of fish they lose to normal spoilage, says Mairs. "This will result in increased profitability in the seafood processing industry."

Produced when air or oxygen is passed through an electric spark, ozone is found in minute quantities in the atmosphere. Following a thunderstorm, it creates the fresh, clean smell in the air.

For the study, researchers set up an ozone generator that produced and dissolved ozone into the water. The whole fish were soaked in treated water and then filleted and vacuum packaged.

The fillets were refrigerated at 41 degrees F for 12 days to monitor the growth of spoilage bacteria. To observe ozone's effect on bacteria on food contact surfaces, researchers also treated knives, cutting tables and employee gloves and aprons.

"Ozone is not meant as a replacement for current sanitation procedures, but to complement current sanitation regimes," says James Yuan, an investigator with Air Liquide Corp., the company that provided the ozone-generating equipment. "If you don't clean down food contact surfaces of flesh, blood and scales, ozone won't be effective."

Now, many seafood processors use chlorine as a sanitizing agent.

Ozone has many advantages over current chemical antibacterial agents, such as chlorine, when used as a sanitizing agent for utensils and equipment, according to Yuan.

"Ozone doesn't leave any chemical residues like chlorine," he says. It also doesn't produce any harmful byproducts, says Yuan.

One difference is that chlorine is cheaper than ozone, he adds.

Since the early 1900s, ozone has been widely used for disinfecting water in swimming pools, spas, cooling towers and sewage plants.

Prior to 2001, ozone could only be used to treat bottled water in the United States. In recent years, researchers found that ozone was an effective antibacterial agent for food and process water, such as poultry chiller water.

Because ozone does not form or leave harmful chemical residues when it is applied to food or food contact surfaces, the FDA extended its use last year for direct contact with all food.

Safety Important for Processors

In the seafood industry, quality and safety are top priorities.

All seafood processors who handle clams, oysters, mussels, crabmeat and certain species of fish must adhere to the U.S. Food and Drug Administration's (FDA) seafood safety program initiative known as Hazard Analysis & Critical Control Point (HACCP).

Implemented in 1997, HACCP is required for most seafood dealers, processors and importers. Through the program, processors and distributors learn how to prevent, eliminate or minimize the biological, chemical and physical hazards in seafood that could cause consumers to suffer illnesses or injuries, some of which could be life-threatening. For example, processors must ensure that shellfish are harvested from state-approved waters.

While HACCP is a management tool that addresses seafood safety, the program rests on Good Manufacturing Practices (GMP). These rules address product quality and sanitation — from the freshness of seafood to cleanliness of food contact surfaces. The control of spoilage bacteria that causes unpleasant odors and flavors is managed under GMP while harmful bacteria is handled under HACCP.

Although ozone can destroy disease-causing bacteria, the object of this project was to control the contamination of seafood by spoilage bacteria.

"To minimize the spread of spoilage and harmful bacteria to seafood, enhanced sanitation control procedures are being developed by both industry and government investigators," says Nash.

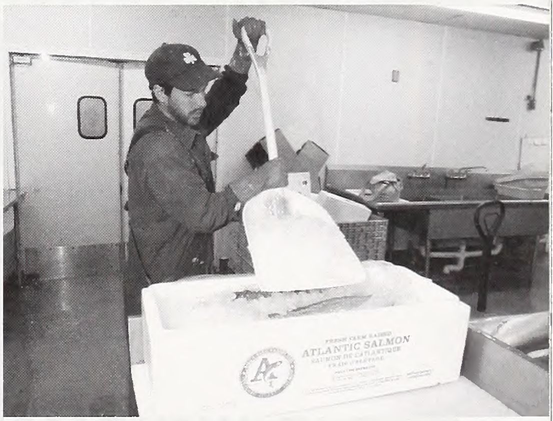
"Based on this research, ozone seems a promising broad-use disinfecting agent for controlling spoilage bacteria that should be considered a part of any seafood sanitation protocol."

The project also reinforced the importance of frequent cleaning schedules during a production shift.

"Our study underscored the importance of intermittent cleaning and sanitation during processing," says Blakistone. "Many processors thoroughly clean utensils and equipment after a production shift has ended. If the frequency of sanitation schedules were increased within a shift, the result could be shelf life extension for highly perishable seafood products."

Blakistone says further ozone studies are needed. "The next step could be to incorporate ozone in ice that is used to pack fish," she says.

"Ozonated ice is a concept that was scientifically evaluated on salmon during the 1980s. While the results of our research should encourage seafood processors to examine the benefits of cleaning fish with ozonated water, future projects should address the shelf life advantages for storing and distributing raw fish in ozonated ice." ◆



TOP: Robb Mairs helped conduct the ozone study at Hanover Sea Products.
MIDDLE: Ozone seems to improve the shelf life of uncooked fish.
BOTTOM: Ozone also enhances the freshness of raw fish during refrigeration.

Catch It and Cook It

By Pam Smith • Photographs by Scott D. Taylor

The recreational angler has countless possibilities for catching the limit without leaving solid ground.

You never know when the "fishing bug" will bite.

Jim Bahen, North Carolina Sea Grant's recreational fishing specialist, recalls a phone call he received from a new oceanfront homeowner.

"For several days he had watched gulls 'working in the breakers,' apparently following schools of fish running up and down the coast," Bahen says. "The man decided it was time to learn what was needed to get his share of the catch."

The questions were typical of most prospective anglers, Bahen notes: What's running? Do I need a license? What kind of gear do I need? What kind of bait should I use? Where is the best fishing?

Bahen usually manages to slow down such over-anxious callers with a "first-things-first" approach to what may become a lifelong hobby — or outright obsession.

Importantly, he always warns, "Although no saltwater recreational fishing license is required, you are required to know the rules. Ignorance is no excuse."

Be prepared by going to the N.C. Division of Marine Fisheries' Web site at *www.ncfisheries.net* to check out current recreational fishing regulations. "If you don't," Bahen says, "you may catch a pretty expensive fish, considering fines and court fees."

Bait and tackle stores and fishing piers are also good reference points.

With more than 300 miles of oceanfront beaches, well-appointed piers and endless estuarine shoreline, the recreational angler has countless possibilities for catching the limit without ever leaving solid ground. Access to a small boat and in-shore charter services add to the choices.

"The Intracoastal Waterway is a virtual highway for fish to move along," Bahen says.

To know what's running and when, Sea Grant's popular *Seafood Availability Chart* (UNC-SG-97-03) is a quick reference for seasonal information on saltwater fish.

Don't be discouraged by what seems to be a "short list" of target species for late spring and early summer. "The waters are just beginning to warm up," Bahen says, "But there are enough fish moving out of creeks and estuaries to make fishing worthwhile. And some anadromous fish, such as striped bass, are moving from open ocean into creeks and rivers to spawn."

Flounder, snapper, bonita and sand perch are among the early season's choices. Flounder, a year-round possibility, don't move in big schools. Flounder tend to stay on the bottom and wait for the food to come to them. Bahen points out that "drifting for flounder" plays right into their waiting game.

"If you have a boat, put two or three rods out. Let the current move — or drift — the boat, to allow your bait to bounce on the bottom," he says.

Again comes a warning: know the line that divides the ocean from the sound. Check current DMF rules for ocean-caught flounder.

Ethical Angling

Responsible and ethical angling is always "in season," Bahen asserts. "The idea of ethical fishing practices developed in recent years in response to stricter fishing regulations and concern over depressed fish stocks. Following some practices, recreational anglers can make a difference in the conservation and management of fish populations."

The cardinal rule: Take only what you

Continued

can use and put back the rest. That doesn't mean that the recreational angler has to cut short his fishing fun, says Bahen, a long-time proponent of catch-and-release practices.

Done properly and promptly, fish sustain minimal injury and stress when anglers employ catch-and-release techniques, especially when using circle hooks. Once the fish takes the bait and begins to swim away, the circle hook slides into the corner of the fish's mouth. Studies show that the angler can reel in the fish, scoop it into a coated landing net, gently remove the circle hook, and return the fish to the water — with little mortality.

Catch and Release: A Guide to Ethical Angling (UNC-SG-02-03), a new Sea Grant publication authored by Bahen, describes in detail the why and how of catch and release.

Along with the use of circle hooks, it's important to match gear to the size of the fish, Bahen adds. The lighter the tackle, the longer it takes to reel in the fish. The harder and longer a fish fights, the less chance it has to survive after being released.

Gearing Up

If he had one rod for surf fishing, what would he choose? Bahen says a good all-purpose choice would be an 8-foot fiberglass rod, with a reel to match the length of the rod for balance. "With an 8-foot rod, you can cast out and retrieve, keeping the line above the breaking wave, without wearing yourself out," he explains. "I'd put a 12-pound test monofilament line on that rig."

You can spend as much or as little as you want — but Bahen encourages beginners to keep it simple. The tackle box should include different tools for different jobs: A flounder rig, a fish-finder rig, various size hooks, live bait and artificial lures.

Bahen, who has been fishing all his life, confesses that each time he baits a hook, it's as much fun as his first time. He loves sharing his enthusiasm with prospective anglers.

Like Bahen, Benjamin "Mac" Currin enjoys working with novice anglers. Currin, who represents recreational anglers on the N.C. Marine Fisheries Commission, is a lifelong saltwater angler. For 17 years, the former researcher has run the North Carolina State University Sportfishing School. The oldest saltwater fishing school in the country, it is marking its 50th anniversary this year.

As for hooks and baits, Currin agrees with Bahen about having a variety of choices for the fish. In other words, cast with several different selections, see what the fish prefer, and go with it.

"In fishing schools, we may have 20 rigs out there at a time — the result is a chumming effect," he quips.

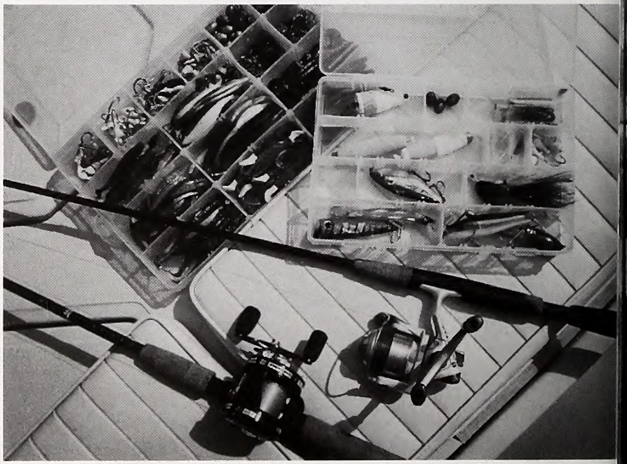
Currin adds a couple of items to the preparation list. He says it's a good idea to learn to tie one good all-purpose knot. He recommends the "uniknot" system to replace a number of different knots for a number of different applications. "Don't cloud your head with too many," he says. "Stick with one that will work well with slippery monofilament."

Another simple trick: Use a sand spike. This low-cost investment enables the angler to use two hands to bait the hook and keeps the rod and reel out of the sand and saltwater. "And always rinse the gear with freshwater after every trip to extend the life of the gear," Currin advises.

Learning the Environment

Currin tries to give novice anglers an appreciation for the environment — to help them begin "thinking like a fish."

"The fish are always in the ocean, but not always at the beach — they follow the food and the water temperature," he says. To locate fish, he tells students to look for some of the obvious indicators — birds diving and



ABOVE: Sportfishing requires close quarters etiquette — and a variety of "tools."
TOP RIGHT: Using catch and release methods extends fishing enjoyment.
BOTTOM RIGHT: Joyce Taylor tests one of her tasty seafood recipes.

shadows of bait fish moving through the surf.

When surf fishing, anglers should learn to read breaking waves in order to identify the deep water — where fish are more apt to be.

With pier fishing, different fish may be accessible at deeper depths and various distances from shore.

But whether surf or pier fishing, he preaches fishing ethics and etiquette. Some areas are crowded. Use common sense and common courtesy. Allow reasonable space to avoid tangling lines — and entanglement with swimmers.

Another safety precaution: When wearing waders, there is no need to be in crashing waves. He warns not to venture beyond calf-high waters.

Also, be aware that hooks are sharp and can be dangerous when being removed from fish.

Currin recommends using pliers to remove hooks from the mouths of fish. Some fish have sharp teeth and can be aggressive.

"Remove the hooks carefully to enhance fish survival and to avoid your injuries," Currin warns.

Both Currin and Bahen have a final suggestion: Purchase two ice chests. One to ice the soft drinks and another to keep the fish fresh until you get them to the kitchen.

Cooking the Catch

From retired Sea Grant seafood education specialist, Joyce Taylor, here are some tasty ways to prepare the early season catch. They are among the many recipes in her Sea Grant cookbook, *No Salt Seafood: All the Flavor Without Salt* (UNC-SG-89-07).

Lime Marinated Snapper with Cilantro Butter

- 4 medium snapper fillets
- 3 1/2 tablespoons fresh lime juice
- 1/2 cup unsalted margarine or butter
- 2 cloves garlic, pressed
- 3/4 cup fresh cilantro, finely chopped
- 1/2 teaspoon dried red pepper flakes
- lime wedges

Place fillets in baking dish or nonreactive pan and pour lime juice over them. Marinate 20 minutes, turning once.

Melt margarine in small, heavy saucepan over medium heat. Add garlic and cook one minute. Mix in cilantro and pepper flakes and cook until cilantro is heated through, about 1 minute. Brush over fish. Broil about 4 inches from heat until fish flakes easily when tested with fork, about 8 to 10 minutes. Garnish with lime wedges. Serves 4 to 8.

Flounder with White Wine

- 2 pounds flounder fillets, skinned
- 1/4 cup fresh lemon juice
- freshly ground black pepper
- 1/4 cup vegetable oil
- 4 medium onions, sliced
- 2 cloves garlic, pressed
- 1/2 cup chopped, fresh parsley
- 1 14.5 oz. can diced tomatoes, drained
- 1/4 cup dry white wine
- 1 lemon, sliced

Sprinkle fish with lemon juice and pepper. In large saucepan, heat oil and add onions, garlic and parsley. Cook until onions are transparent. Add tomatoes and simmer about 5 minutes. Add wine and cook 5 minutes longer. Place half the onion and tomato mixture in greased baking dish. Add fish. Cover with remaining mixture. Arrange lemon slices over top and bake at 400 F until fish flakes easily when tested with a fork, about 15 to 20 minutes. Serves 6 to 8. ◘

NORTH CAROLINA SEA GRANT
NORTH CAROLINA STATE UNIVERSITY
BOX 8605
RALEIGH, NC 27695-8605

ADDRESS SERVICE REQUESTED

PERIODICALS
POSTAGE PAID
AT RALEIGH, NC

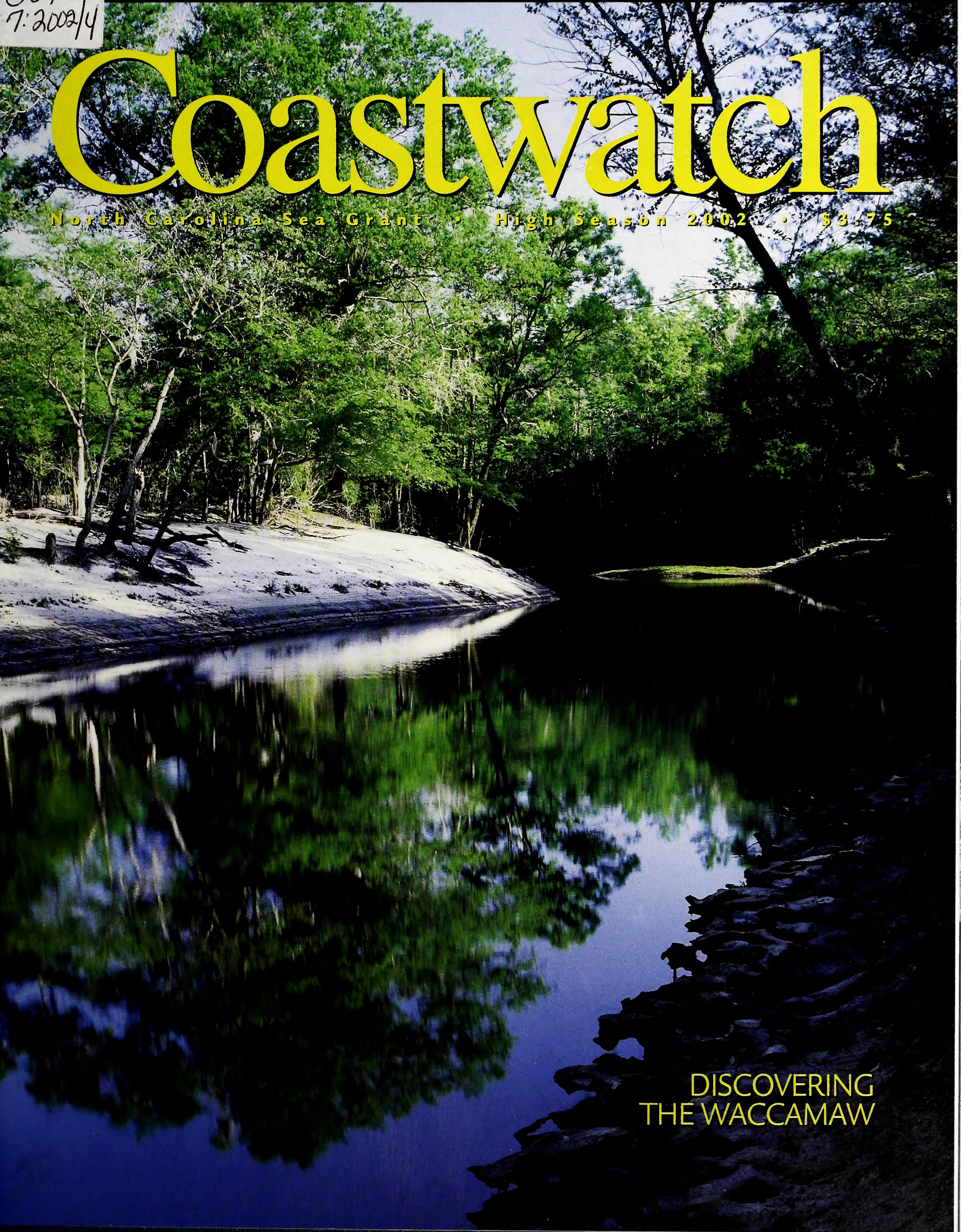
COASTWATCH

G69
7:2002/4

SE SPAWNING • COASTAL PLANNING • SHARK SAFETY

Coastwatch

North Carolina Sea Grant • High Season 2002 • $3.75



DISCOVERING
THE WACCAMAW

FROM THE EDITOR

Signs of Summer

Herman Lankford

For some folks, a summer beach excursion may be a simple day trip squeezed into a hectic schedule. For others, it may be a Fourth of July family reunion for 40 that takes a year or more to plan.

While year-round schools and Carolina sunshine extend the "official" beach season, Memorial Day still marks the start of summer fun for most of us. This year, North Carolina Sea Grant marked the holiday weekend with programs in Dare County and on Topsail Island to thank the National Weather Service and beach communities for supporting our rip current safety campaign — and to remind swimmers and waders of the tremendous power of the Atlantic Ocean.

The newest safety efforts include permanent signs — each containing diagrams, telltale warning signs and a simple refrain: If caught in a rip current, don't panic. Swim parallel to shore.

And the weather service unveiled its new online "portal" for rip current information: *www.ripcurrents.noaa.gov.* Residents and tourists can request online forecasts for rip current risks along the North Carolina coast and in other locations of the country.

Even though I had made many phone calls and sent a slew of e-mails about the new rip current signs — and I knew that 500 had been posted all along our coastline, and more signs were on order — there was a sense of excitement on that trip to the coast. As we drove down Topsail Island, I couldn't help but point out the new signs at public access points and other crossovers.

Soon, Spencer Rogers, our North Carolina Sea Grant coastal erosion specialist, not only was explaining how rip currents form, but also giving a bit of history of the safety campaign. He cited an initial poster effort in the 1980s that resulted in a "Thank You" letter from someone who had seen a poster at an Outer Banks beach cottage. Later, the letter writer got caught in a rip current — and knew what to do.

We don't know how many people have had to put our rip current lessons into action over the years. Nor do we know exactly how many will notice the new signs in their hustle to get to the beach itself. But our hope is that folks will notice — and remember.

We do know that within a week of our Memorial Day weekend event, weather and surf conditions resulted in forecasts for dangerous conditions — and numerous rip current rescues. The local media knew to call upon Spencer to explain the science behind rip currents and to offer important safety tips for the public.

It's a message that Spencer never tires of sharing — for he still remembers that one letter years ago.

Have you seen the new rip current signs along the North Carolina coast? Did you learn to look for and avoid rip currents — and to respond if you were caught in a rip current? Or, did the signs offer a science lesson for youngsters?

If you would like to share a story about rip currents, send an e-mail to me at katie_mosher@ncsu.edu *or to Spencer Rogers at* rogerssp@uncwil.edu. *Or, you can write a note to North Carolina Sea Grant, NCSU Box 8605, Raleigh, NC 27695-8605.*

Katie Mosher, Managing Editor

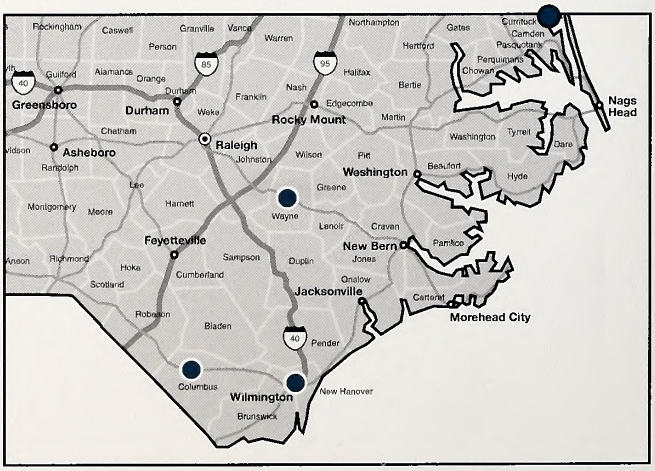
IN THIS ISSUE

Contributing Writers:

Ann Green ▫ Cynthia Henderson ▫ Robin Sutton
Katie Mosher ▫ Pam Smith

Contributing Photographers:

Chris Crumley ▫ Michael Halminski ▫ Herman Lankford
Lundie Spence ▫ Ken Taylor ▫ Scott D. Taylor



North Carolina's diverse coast offers countless interesting subjects. The large dots on the locator map indicate story settings in this issue — from northeastern county of Currituck to Wayne, Wilmington and Columbus counties in the southeast.

N.C. DOCUMENTS
CLEARINGHOUSE
JUL 1 1 2002
STATE LIBRARY OF NORTH CAROLINA
RALEIGH

Coastwatch

FEATURES

COASTAL TIDINGS 2

WACCAMAW RIVER:
ABUNDANT RESOURCES PROVIDE ENCHANTING EXPERIENCES
Join Ann Green and Lundie Spence as they paddle along the pristine waters of the Waccamaw River in Columbus County. The unique river system is home to rare plants and wildlife, which several groups are working to preserve. 6

HOMEWARD BOUND:
NEUSE SPAWNING GROUNDS REOPENED
How far will American shad and striped bass swim to find suitable spawning sites? The short answer is: much farther upstream since the removal of the Quaker Neck Dam on the Neuse River. Cynthia Henderson writes about what scientists are learning by tracking the migration of both species. 12

LAND-USE PLANNING:
COASTAL COUNTIES PREPARE FOR THE FUTURE
New rules for coastal planning are set to go into effect in August. Pam Smith explains how some coastal counties are working with the N.C. Division of Coastal Management to design their own destinies. 17

BOOK MARKET:
Ahoy! All Aboard for Coastal Adventures
Keeping youngsters entertained during summer vacation need not be a challenge, as long as there are plenty of books on hand. Robin Sutton presents a "just for kids" list of books that will transport readers to sandy shores. 21

LEGAL TIDES:
Sea-Level Rise May Put Nature and Growth on Collision Course
Global warming and rising seas need to be factored into the land-use equation, but it's difficult to stir a sense of urgency with such a long-term issue. Find out how policy and nonregulatory measures are being explored as solutions. 23

SEA SCIENCE:
Risk of Shark Attack is Minimal
The media has the public stirred up about shark attacks. But, scientists say bees, wasps and snakes are responsible for more fatalities each year than sharks. Learn the facts, and then enjoy your next swim in the ocean. 26

Coastwatch

Managing Editor
Katie Mosher

Senior Editors
Ann Green
Pam Smith

Contributing Editor
Cynthia Henderson

Designer
L. Noble

Circulation Manager
Sandra Harris

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 15-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X)
is published six times a year by the
North Carolina Sea Grant College Program,
North Carolina State University, Box 8605,
Raleigh, North Carolina 27695-8605.
Telephone: 919/515-2454. Fax: 919/515-7095.
Subscriptions are $15.
E-mail: katie_mosher@ncsu.edu
World Wide Web address:
http://www.ncsu.edu/seagrant
Periodical Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch,* North Carolina Sea Grant, North Carolina State University, Box 8605, Raleigh, NC 27695-8605.

Sea Grant
North Carolina

Front cover photo of Waccamaw River and table of contents photo of mayfly by Ken Taylor. Printed on recycled paper.

COASTAL *TIDINGS*

Forecast for Heavy Hurricane Season

The National Oceanic and Atmospheric Administration is forecasting an above-average Atlantic hurricane season, which runs through Nov. 30. NOAA is predicting six to eight named hurricanes for the region — with two or three expected to be classified as major. In all, nine to 13 tropical storms are predicted to form.

Experts say the key climate factors affecting this year's forecast are long-term patterns of tropical rainfall, air pressure and higher temperatures in the Atlantic Ocean — factors that aid hurricane development.

NOAA scientists say they will continue to monitor evolving climate patterns. An updated hurricane outlook goes online at *www.noaa.gov/* in August.

Meanwhile, NOAA advises residents in hurricane-prone areas to keep up their guard. August 2002 marks the 10th anniversary of Hurricane Andrew, which caused major devastation in Florida and Louisiana. Since then, NOAA has continued to make heavy investments to enhance forecasting and warning capabilities.

– P.S.

In the Next Issue of *Coastwatch*

For many years, sportfishing enthusiasts have been flocking to the Alger Willis Fish Camp at Cape Lookout National Seashore. Join Ann Green on a colorful visit to the camp.

Healthy coastal waters depend on healthy river systems. Walk along the restored Rocky Branch with Barbara Doll, Sea Grant water quality specialist.

Jumping Run Project Cited in Conservation Award

Scott D. Taylor

The Carteret-Craven Electric Cooperative received the Governor's Conservation Award for Industrial/Municipal Conservationist of the Year. The Award was given by the North Carolina Wildlife Federation.

The electric co-op was cited for the Jumping Run Wetlands Restoration Project on its N.C. 24 property in Newport. Jumping Run is a tributary of the White Oak River — an important shellfish resource. The constructed wetlands project was designed to protect the river's water quality.

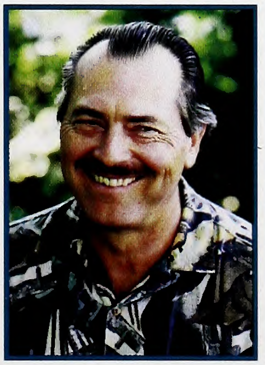
CCEC collaborated with North Carolina Sea Grant, North Carolina State University's College of Design and Water Quality Group, and the N.C. Division of Water Quality.

In addition to Jumping Run, CCEC was praised for its support of the Blue Fin Tuna Research Project, the North Carolina Artificial Reef Program, building osprey nests in marshlands, and for allowing endangered plant species to be studied and protected on some of the cooperative's substation land.

The Governor's Conservation Achievement Award program gives recognition to individuals and organizations that help protect and sustain the environment.

– P.S.

Sea Grant Director Receives Award



Scott D. Taylor

The Coastal Society presented the 2002 President's Award to Ronald G. Hodson, North Carolina Sea Grant director. The award was presented during the TCS biennial conference held in Galveston,Texas.

Hodson was cited for his professional leadership and for his continuing support of TCS, an international organization concerned with coastal resource management. Its members are from academia, government and private sectors.

"Ron has provided professional encouragement to TCS," says Walter Clark, North Carolina Sea Grant coastal policy specialist, who served as TCS president for the past year.

"Ron has committed staff support and time to further the Coastal Society's work," Clark adds.

Hodson, an expert in marine aquaculture, joined North Carolina Sea Grant in 1981. He has been director since 1998.

– P.S.

Scott D. Taylor

Pam Smith, center, listens to Walter Clark, Sea Grant coastal policy specialist, discuss coastal processes with an Encore member.

Pam Smith Earns Honors

Pam Smith, a North Carolina Sea Grant writer/editor, recently received an Award of Excellence in the Research and Graduate Studies unit of North Carolina State University.

Smith, a senior editor of *Coastwatch*, was cited for her tireless dedication to Sea Grant projects and efforts to create a friendly work environment for fellow staff members.

She has brought statewide media attention to the Rocky Branch stream restoration project spearheaded by water quality specialist Barbara Doll. For *Coastwatch*, Smith's stories describe how Sea Grant research and extension efforts help communities meet state and federal regulations for coastal policy and water quality.

"Sea Grant benefits greatly from Pam's talent, skills and personality," says director Ronald G. Hodson.

Prior to joining Sea Grant, Smith worked in the NC State News Services and as a newspaper reporter. – K.M.

Storm Exhibit Opens at Aquarium

Courtesy of N.C. Aquarium on Roanoke Island

As a charter boat captain for more than 50 years, Omie Tillett has many first-hand accounts of hurricanes and northeasters along the Outer Banks.

Listen to Tillett's storm tales at the new "Storms" Exhibit at the North Carolina Aquarium on Roanoke Island.

The exhibit also includes news and amateur video clips and images by photographers Michael Halminski of Waves and Drew Wilson of the *Virginian-Pilot*.

In addition, a "real time" weather station will monitor the current conditions outside the aquarium, and a hurricane-tracking chart will be available to monitor storms.

For more information about aquarium hours, contact Daryl Law, 252/473-3494, ext. 224/243. — A.G.

Center for the Sounds Opens

A new center that highlights ecotourism has opened in Columbia.

Since May, the Walter B. Jones Sr. Center for the Sounds has taken an interactive approach to environmental education with the opening of a new indoor/outdoor habitat. As visitors walk through the center, they have the opportunity to view newly installed interactive exhibits that describe the wildlife and habitats of the refuge, according to Howard Phillips, of Pocosin Lakes National Wildlife Refuge.

One exhibit, The Refuge Management Game, presents visitors with a situation that a refuge manager might face and guides them through the decision-making process.

From inside dioramas of a black bear and endangered red wolves to an outdoor Scuppernong River habitat boardwalk, visitors actively learn about the refuge.

The late Walter B. Jones Sr., the center's namesake, served as congressman from North Carolina's First District from 1966 to 1992. The building honors his efforts in promoting legislation to allow the study and protection of the Albemarle and Pamlico sounds.

Nestled on the Scuppernong River waterfront, the Center for the Sounds is located next to the Tyrrell County Visitor's Center in Columbia, just off U.S. 64.

— R.S.

Rewards Offered for Blue Crabs

They're wanted. Thousands are out there.

They're hardened, but not criminals. They are blue crabs bearing tags in a variety of hard-to-miss shapes and colors. And, while rewards are offered, the real prize for finding them is helping scientists learn how to protect the state's most valuable fishery.

Dramatic declines in blue crab harvests have scientists and crabbers concerned. In 1996, over 65 million pounds of hard crabs were landed. In 2001, that number dwindled to less than 29 million pounds, according to N.C. Division of Marine Fisheries (DMF) data.

Anyone who finds tagged crabs can help with research, simply by reporting to appropriate researchers information such as tag number and date, location and depth of capture.

"We're interested in the same thing crabbers are — maintaining a sustainable fishery," says Tom Wolcott, researcher with North Carolina State University's Center for Marine Sciences and Technology.

"The more we know about the basic biology of these animals, the more we'll be able to make rational and appropriate decisions about management," says Wolcott.

Along with fellow researcher Donna Wolcott and commercial crabber Robin Doxey, he expects to tag a total of 3,000 crabs as part of a study of how crabs use spawning sanctuaries. Rewards for the hot pink tags range from $5 to a "Blue Crab Nabber" cap and a chance to win $500.

Last year, Dan Rittschof of the Duke Marine Lab drew attention to with low-cost tags made of poker chips. This year, students will help with tagging for the study of female blue crab migration. Rittschof projects a total of 12,000 tagged crabs by the end of this year. A reward of $1 is offered for poker-chip tags.

The Rittschof study is supported by the North Carolina Blue Crab Research Program, which is funded by the N.C. General Assembly and administered by North Carolina Sea Grant. The program seeks to involve commercial crabbers in crab research.

Later this year, DMF will add to the number of tagged blue crabs in a study of how hurricanes affect crab movement and habitat.

For more information about the Blue Crab Research Program, contact Marc Turano at 910/253-2610, e-mail marc_turano@ncsu.edu.

If you find a tagged blue crab, follow directions on the tag or contact the following:

Hot pink tags for the Wolcott/Doxey study: 252/222-6331, e-mail tom_wolcott@ncsu.edu.

Poker chip tags in various colors for the Rittschof study: 252/504-7636, e-mail ritt@ duke.edu *or call Trish Murphey, N.C. Division of Marine Fisheries 252/726-7021, ext. 318.* — C.H.

Commercial Harvests Down Last Year

Declining harvests of crabs and shrimp, coupled with poor market conditions after the Sept. 11 terrorist attacks, greatly affected the catch and value for commercial fisheries in 2001, according to the N.C. Division of Marine Fisheries (DMF).

In 2001, commercial fishers landed 137.1 million pounds of fish and shellfish at North Carolina docks, with the catch valued at $88 million.

Total landings dropped 17.1 million pounds from 2000 and 43.3 million from the previous five-year average of 181.4 million pounds. This makes the 2001 harvest the second-lowest catch since 1973, when 130.4 million pounds of seafood were landed at North Carolina ports, according to DMF.

The reported dollar values of the top species were: blue crabs, $25 million; shrimp, $11.9 million; southern flounder, $5.6 million; hard clams, $5 million; and Atlantic menhaden, $4.6 million.

There was some good news on the commercial seafood front. Peeler and soft crab landings increased by 320,000 and 172,000 pounds respectively. Croaker landings also increased to 12 million pounds, a 2 million-pound gain over the 10 million-pound average for the previous five years.

Recreational anglers enjoyed their largest catch in the past 13 years, with big gains in dolphin, spot and bluefish landings. About 23.9 million pounds of fish were caught by recreational anglers in 2001, a 2.7 million-pound increase over the 21.2 million pounds landed in 2000, according to DMF.

– A.G.

Fishery Resource Grants Awarded

Satellites far above the earth may help sea turtles and flounder gill-netters coexist in the Pamlico Sound, thanks to a new research project funded by the North Carolina Fishery Resource Grant Program (FRG).

Commercial fisher Bill Foster of Hatteras is teaming with Andrew Read of the Duke University Marine Lab to tag Kemp's Ridley, green and loggerhead turtles with transmitters. Satellites will track movements of the turtles and record environmental data. The information could help predict where nets can be set to avoid harming turtles or unduly restricting fisheries.

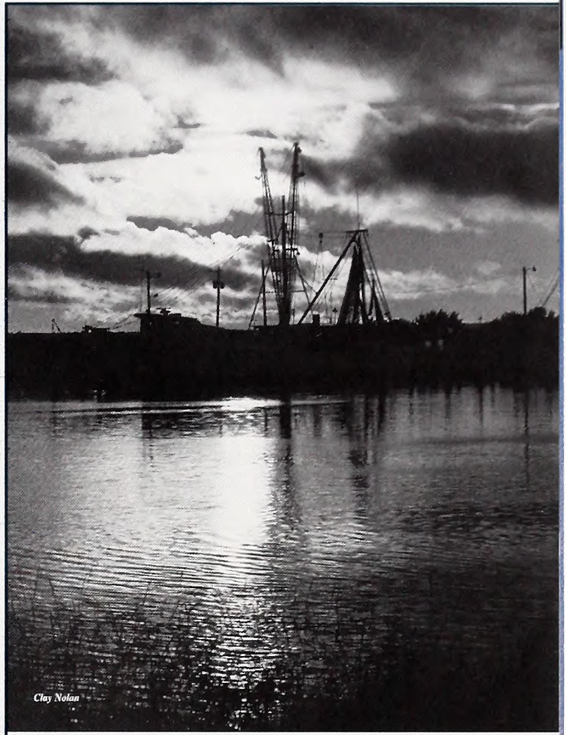
FRG, which is funded by the N.C. General Assembly and administered by North Carolina Sea Grant, allows people involved in fishing and seafood-related industries to try out new ideas for protecting or enhancing coastal resources.

This year 23 projects from up and down the coast were funded, for a total of more than $937,000. Ronald G. Hodson, North Carolina Sea Grant director, says that partnerships, such as that with Foster and Read, benefit both sides.

"I'm quite pleased that our fisherman/academic partnering model is working — it includes roughly half of our projects this year. These associations bring an understanding of the science behind fishery management to fishermen while giving scientists a real-world perspective," Hodson says.

This year's projects range from trapping conch for a possible new fishery to repelling bottlenose dolphins from fishing boats. Other projects take seafood from the water to the table through aquaculture studies and the development of new seafood products.

Proposals for 2003 will be due Dec. 2, 2002. For more information on the FRG program, visit the Sea Grant Web site at *www.ncsu.edu/seagrant* and follow the research link or call 919/515-2454. – C.H.


Clay Nolan

Sneads Ferry Shrimp Festival Set

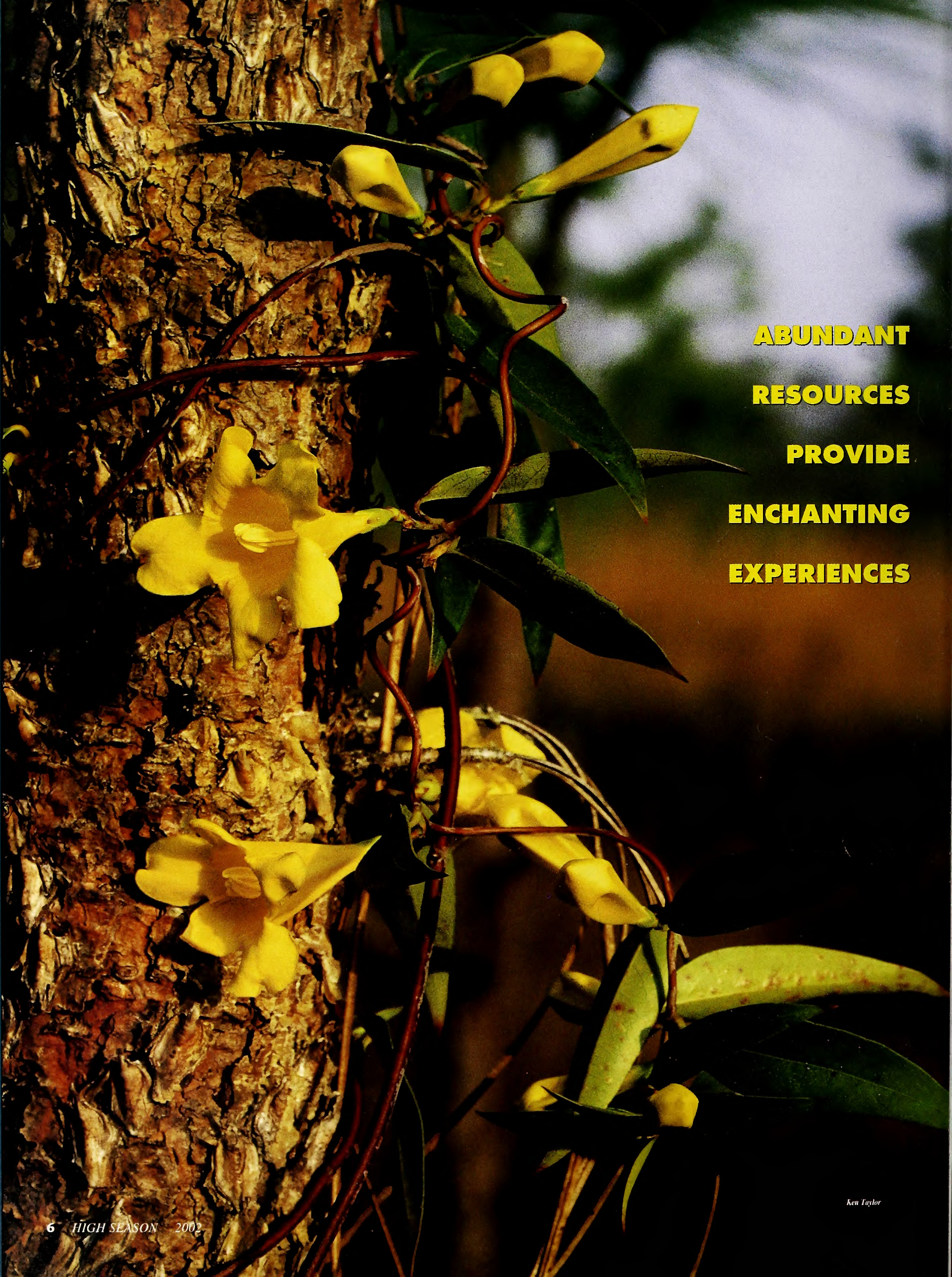
For 32 years, the Sneads Ferry Shrimp Festival has captured the spirit of a North Carolina fishing village. This year's festivities, set for Saturday, Aug. 10, is no exception.

The day begins with a 10 a.m. parade and ends with 9:30 p.m. fireworks. In between are activities for young and old to enjoy, including the crowning of the 2002 Miss Shrimp; rides and games; regional craft displays; and civic, military and commercial exhibits. Shrimp tops the food fare of the day.

In addition, the New River Fisherman's Association will display fish and shrimp nets.

Two stages will be set for entertainment throughout the day, culminating in a street dance with beach music at 8 p.m.

For further information, go online to *www.sneadsferry.com/*. – P.S.



ABUNDANT

RESOURCES

PROVIDE

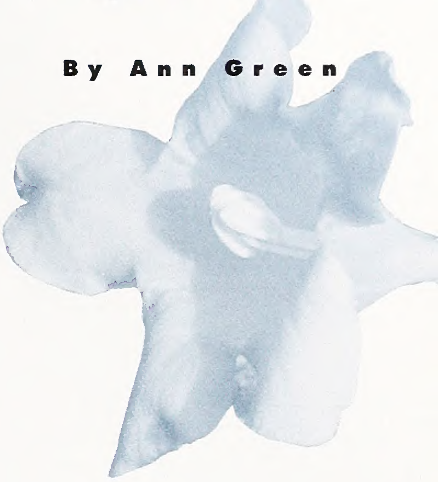
ENCHANTING

EXPERIENCES

Ken Taylor

Waccamaw River

By Ann Green



It's a clear, sunny day as Doug Smith pushes an aluminum canoe into the slow-moving water of the Waccamaw River.

As Smith paddles through a thick, forested area in Columbus County, he notices a ripple in the water and maneuvers around some tree branches.

"This is where beavers are building a small dam," says Smith, who is leading a trip down the river. "There were no beavers on the river when I was a child."

As Smith continues to stroke down the river, the only sign of life is the lapping of paddlers and the drumming of a pileated woodpecker.

"When you go down the river, it is like going back a hundred years," says Smith. "You hear an occasional plane, and that is it."

Joy Pinson of Murrells Inlet, S.C., agrees.

"I have been on the Waccamaw in South Carolina, but not this far up," says Pinson, president of the Winyah Rivers Foundation. "It is so quiet and remote."

Throughout the paddling trip, the water level is only knee deep because of the low amount of rain. The color of the water is so black and clear that it looks like a mirror reflecting giant cypress.

"The water is black because it drains through hardwood swamp forests and collects tannins that come from decomposing organic matter," says North Carolina Sea Grant education specialist Lundie Spence, who was part of the paddling group. "The water is perfectly clean. Because there has been no recent rain, the river isn't carrying any sediments and is very clear."

The paddling trip is one of the first for the newly formed Waccamaw River Outdoor Center in Columbus County.

"By showcasing the Waccamaw, we are going to protect the river," says Charles Hickman, a co-owner of the outdoor center. "We will bring in people who care about the environment and keep the river from disappearing. If we don't do something, the river will disappear in a hundred years."

Last year, Hickman, Smith and William Wayne purchased 60 acres at Old Dock near Whiteville. Near the Waccamaw riverbank is a large grassy area where canoes and kayaks can be stored, and cars can be parked.

The group plans to build an education and convention center on the picturesque property.

"We have access to many landings all along the river," says Hickman. "My vision is to have marked hiking and paddling trails with wildlife observation stations all along the way."

WACCAMAW WATERSHED

The center is located near the river's headwaters, not far from Lake Waccamaw in Columbus and Brunswick counties. The river converges with the Intracoastal Waterway near Bucksport, S.C., empties into Winyah Bay, and then flows past Georgetown to the Atlantic Ocean.

The Waccamaw River is part of the Waccamaw Drainage System, which consists of three headwater streams: White Marsh Swamp on the west, Juniper Creek and Green Swamp on the east, and the upper Waccamaw River, which drains Lake Waccamaw and other surrounding swamps.

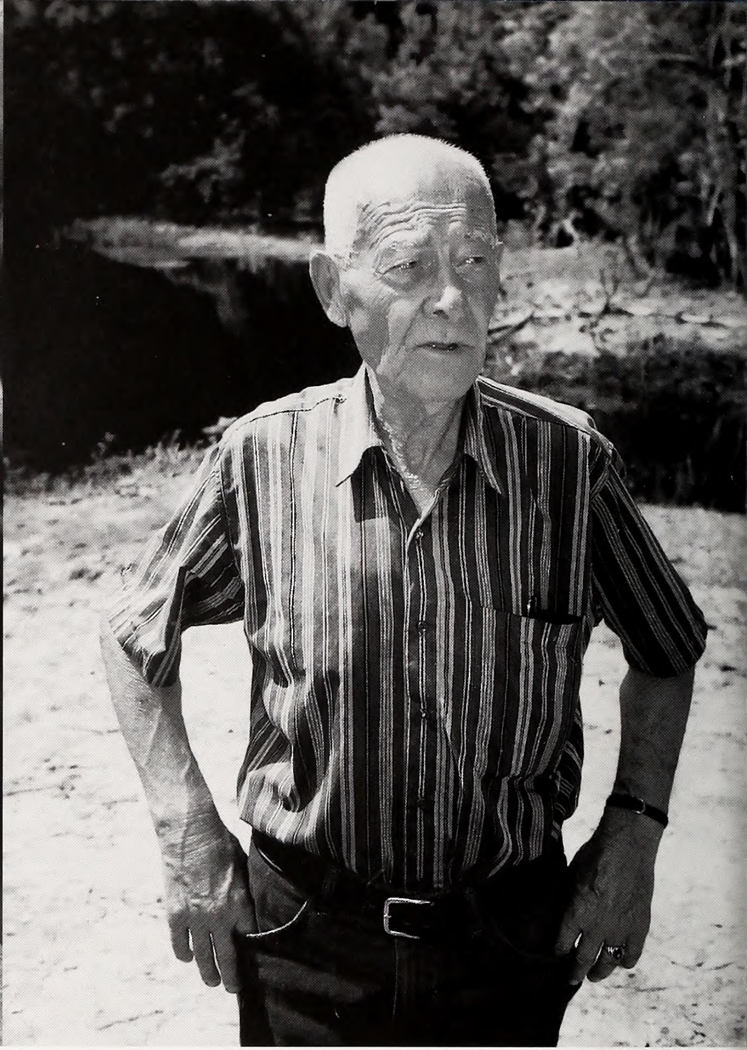
"The water flow of the Waccamaw River system is important," says Spence. "It is similar to the Everglades in Florida, where water flows over the larger wetlands in a thin layer and finally drains into the main body of the Waccamaw River.

"This sheet flow allows for slow infiltration of stormwater and prevents sediment from flowing into the river and also keeps the water flowing evenly. If toxins flow into upstream waters, they can affect everything downstream."

One of the Waccamaw's most important wetlands is the Green Swamp, which is a botanical wonderland with small remaining areas of pine savannas and bay forest. The swamp also contains at least 14 different species of insectivorous plants, including extensive populations of Venus flytrap,

Continued

Ken Taylor



Lundie Spence

LEFT: Frogs and other wildlife inhabit the Green Swamp. RIGHT: DoDo Clewis has worked the Waccamaw River his whole life.

sundew and four species of pitcher plants.

Several rare and unique animals also live in the swamp, including the red-cockaded woodpecker, the eastern diamond-back rattlesnake, Bachman's sparrow and the American alligator.

The North Carolina Nature Conservancy protects 15,900 acres of the swamp, a National Natural Landmark.

Recently, the conservancy bought 2,500 acres in tracts along the Waccamaw and Juniper Creek and 553 acres in the frequently submerged floodplain along the waters of White Marsh.

Hervey McIver, N.C. Nature Conservancy land protection specialist, says the White Marsh is an important water source for the Waccamaw River. "Protecting water quality in the White Marsh by maintaining the filtering capacity of its forests not only enhances the full array of aquatic life near Whiteville, but also is critical to aquatic habitat downstream," he says.

The river is also near Lake Waccamaw and Lake Waccamaw State Park. Lake Waccamaw is home to native fish and mollusk that are found only in or around the lake, including the Waccamaw killfish. It also has at least five species on the state's rare plant list.

CRUSOE ISLAND

Columbus County also boasts a rich cultural heritage. For many years, Crusoe Island, now called Riverview, was home to numerous canoe builders and distinct river folks. Crusoe is technically not an island. However, it is surrounded by swamps and the Waccamaw River.

Because of the community's isolation, most residents have a "distinctive" dialect, according to a study conducted by North Carolina State University graduate student Amy Gantt under the direction of Walt Wolfram, a William C. Friday distinguished professor in English.

"The approximately 100 European-American residents of Crusoe Island also are typified by their independence and wariness of outsiders," the report says. Preliminary research has shown that the Crusoe Island dialect combines some features of southern pronunciation such as "tar" for "tire" and "fahn" for "fine" with some unique traits, such as the nasalization of vowels reminiscent of the way French speakers nasalize their vowels in words like "pan" or "bon."

One of the island's oldest residents is DoDo Clewis, 70, who lives in a tiny white house that is on a dead-end road and within a few yards of the riverbank.

"I was born here and lived here all my life," says Clewis. "My papa dug boats. I watched him dig."

Until recent years, Clewis was an active boat craftsman, digging boats, bowls — and

Ken Taylor

ABOVE: Doug Smith, center, leads paddling groups down the Waccamaw, including supporters of the Winyah Rivers Foundation.

even a few graves. The canoes were made from large cypress trees that he split in half with a saw. He then dug out the trees' cores with an ax.

"Canoes were better man-made than they are now," says Clewis. "It took some work to dig them. I used a big log and an ax. Gave my last boat to the Scouts."

The tradition is a dying art because of new types of materials for manufactured canoes and a dwindling supply of cypress, according to Hickman.

The inside of Clewis' home reflects his simple life on the river. The living room has a wood stove. On the walls are numerous photos of his dugout canoes and mounted deer.

"I been hunting all my life," he says. "There ain't no deer in the swamp I couldn't get."

A plank boat with a paddle lies on the floor of the covered porch.

For most of his life, Clewis fished each day in the river. He walks to the riverbank, drawing a line in the dirt to show the path of the river.

"The river comes up and then gets narrow and turns again. It goes about a mile and then moves into the lake," he says.

ECOTOURISM

With the rich heritage of Crusoe Island and the river's abundant natural resources, Columbus County is an untapped area for ecotourism.

"Ecotourism has a lot of value in Columbus County because a lot of industries have folded here," says Scott Schmolesky, park ranger/technology instructor at Southeastern Community College in Whiteville. "Lake Waccamaw and the river are such natural gems."

Spence agrees.

"When people go to a new area to paddle, they usually come down to see the wildlife and beauty," she says. "But more often, they get hooked on the people."

In eastern North Carolina, ecotourism — which includes paddling and other outdoor activities — has boosted local economies.

Each year, paddlers contribute more than $148 million to North Carolina's coastal economy, according to a survey conducted by North Carolina Sea Grant extension director Jack Thigpen. Nearly one-third of these paddlers have an annual household income of more than $90,000, and more than two-thirds are professionals or managers, the survey reports.

"Clean water was the number one reason to choose a paddling location," says Thigpen.

Because of its remoteness and beauty, canoeists have been paddling the river for centuries. In 1878, Nathaniel H. Bishop wrote

Continued

Ken Taylor

Ken Taylor

LEFT: Waccamaw Outdoor Center is near the headwaters of the Waccamaw. RIGHT: Lundie Spence is dwarfed by a huge cypress.

of his Waccamaw adventures in the *Voyage of the Paper Canoe.*

"Down the tortuous, black, rolling current went the paper canoe, with a giant forest covering the great swamp and screening me from the light of day," Bishop wrote. "The swamps were submerged, as the water poured out of the thickets into the river it would shoot across the land from one bend to another, presenting in places the mystifying spectacle of water running up the stream, but not up an inclined plain.

"Festoons of gray Spanish moss hung from the weird limbs of monster trees, giving a funeral aspect to the gloomy forest, while the owls hooted as if it were night."

WACCAMAW STUDY

A recent study of the Waccamaw River system by East Carolina University geologists recommends the creation of an independent commission to protect the water system and associated ecosystem's abundant animal and plant populations.

"Wetlands in the vast Waccamaw drainage system originally represented 7.3 percent of the original total wetlands in North Carolina," according to the study. "However, today the Waccamaw system is in serious jeopardy due to centuries of extreme land-use modifications resulting from growth and development pressures."

The use of these lands for expanded agriculture and timber production, along with growing industrial and urban development, has led to accelerated ditching and draining, a team of researchers wrote in the report published by the N.C. Division of Water Resources.

"If people want to save the swamp and drainage system, it needs to have a comprehensive management plan that is developed by and implemented on a local basis by local citizens and user groups," says ECU geologist Stanley R. Riggs, a former Sea Grant researcher who led the five-year study. "We need to get all user groups around the table talking and working together," Riggs adds.

"The drainage system has been severely abused by groups that have ignored the cumulative impacts of all other activities and the long-term processes. We must use it and manage it based upon the dynamics of the drainage system."

Riggs says the regional water management plan must include the interaction and linkage between ground and surface water.

"The drainage system is like an organism with many parts that all work together and interact," says Riggs. "User groups need to pay attention to this."

To protect the river, North and South Carolina residents formed the Winyah Rivers Foundation.

This summer, the grassroots organization is hiring a riverkeeper to protect the river's resources.

Ken Taylor

ABOVE: Paddlers can experience untouched natural areas along the Waccamaw.

"We chose the Waccamaw because it is still in fairly good condition," says Pinson. "With the growth of the Grand Strand in North and South Carolina, it makes this timely. We need to prevent further degradation of the river."

The Winyah Foundation and other groups also are fighting a large regional landfill on a 760-acre parcel in the heart of the Green Swamp, southwest of N.C. 211 in Columbus County.

"We feel there is too much risk associated with placing a landfill in the Green Swamp, which is at the headwaters of the Waccamaw," says Pinson.

The Columbus County Board of Commissioners already has approved the project.

"The county is spending $1.5 million a year to dispose of solid waste," says Amon McKenzie, chairperson of the Columbus commissioners. "We need a place to dispose waste. The experts were given the task of finding the most practical place. The swamp was what they came up with. We have spent 10 years trying to find an area for the waste."

However, Lake Waccamaw Mayor Bo McNeill and a number of concerned residents are fighting the project.

"I don't think it will be environmentally safe," says McNeill.

Lake Waccamaw is one of the largest natural lakes in the United States east of the Mississippi and has the distinction of being the only lake in North Carolina to have been designated an 'outstanding resource water.'

The landfill is at higher elevation than the lake. "The site for the landfill drains into a creek. Any contaminants will run into Lake Waccamaw or into a creek, ending up in the Waccamaw River. The Waccamaw River is known to be one of the cleanest rivers in North Carolina. The potential danger to the environment for Lake Waccamaw or the Waccamaw River is too great for this landfill," says McNeill.

The landfill still has to be approved by state and federal regulators.

Despite the debate, the bountiful resources on the river provide many opportunities for paddlers.

"It is a beautiful wilderness," says Hickman. "Other than what loggers have done, the area is untouched. It is as far in the country as you can get. It is quiet, and nature lovers fall in love with it." ◘

To contact the Waccamaw River Outdoor Center, call 888/863-7978 or go online at www.4wroc.com/.

To order a CD of the report "The Waccamaw Drainage System: Geology and Dynamics of a Coastal Wetland, Southeastern North Carolina," contact Jeff.Bruton@ncmail.net *or visit the Web:* www.ncwater.org/ *and follow the link to reports and publications on the Waccamaw.*

SPAWNING G

NORTH CAROLINA Wildlife RESOURCES COMM.
INLAND FISHERIES
NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

Homeward Bound: Neuse Spawning Grounds Reopened

By Cynthia Henderson
Photos by Herman Lankford

When summer intruded early into spring this year — bringing 90-degree temperatures to the same day that, a year ago, had seen snow flurries in parts of central Carolina — the striped bass and American shad seemed not to have been surprised.

Catches of these species on the Neuse River near Goldsboro peaked the week before the heat wave, according to Christian Waters, fisheries biologist for the N.C. Wildlife Resources Commission (WRC).

Early each spring, American shad and striped bass seek freshwater rivers and streams in which to spawn, preferring temperatures at or below 75 degrees. The ones that make it to the Goldsboro stretch of the Neuse can be shocked to find Waters and WRC assistant biologist Jason Farmer waiting for them.

Literally shocked. Waters and Farmer use electrofishing techniques to catch, study and release American shad and striped bass on the Neuse.

The scientific interest generated by the return of American shad and striped bass implies that this is more than a routine annual event. Rather, this springtime migration signifies the reopening of habitat that was, for many years, nearly lost to such anadromous fishes — those that spend most of their lives in the ocean and return to freshwater rivers or streams to spawn.

Continued

Christian Waters weighs the catch as Jason Farmer records data for the N.C. Wildlife Resources Commission.

TOP: Researcher Joe Hightower measures a striped bass near the fallen log where it was caught.

BOTTOM: Waters and Farmer tie up at the river's edge to examine the catch.

The Quaker Neck Dam was built in 1952 near Goldsboro to provide cooling water for a steam electric plant. Despite the installation of a fish ladder to help migrating fish swim upstream, most studies showed that access to historical spawning grounds was restricted, according to Joe Hightower of the U.S. Geological Survey (USGS) and associate professor of zoology at North Carolina State University.

The dam, which was no longer needed for the electric plant, was removed in 1998 — an action partially supported by the N.C. Fishery Resource Grant program (FRG), which is funded by the N.C. General Assembly and administered by North Carolina Sea Grant. After the dam removal, Hightower received FRG funding to use radio telemetry to track American shad and striped bass to see if the fish made use of the newly available spawning grounds.

"American shad historically are considered a high-quality eating fish," Hightower says of the largest member of the shad family. In a report about habitat restoration priorities, Hightower cites data from the 19th century indicating that American shad migrated well into the piedmont. North Carolina had one of the largest American shad fisheries in the United States in the late 1800s, and the Neuse was thought to have one of the largest runs in the state, Hightower says.

Less is known about historical populations of striped bass — also known as rockfish — because its recreational and commercial popularity is a more recent phenomenon.

Hightower's study on habitat restoration and continued monitoring by the WRC is important because many rivers have similar dams. Some have been adapted — with varying degrees of success — to aid fish passage. But many, like the Quaker Neck, no longer serve any purpose and merely block migration of anadromous fishes. Hightower explains that many such species have suffered dramatic declines in abundance.

"Old reports from the 1800s show that American shad will go upstream as far as they can go," Hightower says. In a similar FRG study before the dam was removed, Hightower and zoology graduate student Chris Beasley found the dam to be an impediment. "None of the American shad with transmitters made it over the dam," Hightower says. In the 1999-2000 post dam-removal study, American shad were tracked 35 miles upriver from the dam site. Striped bass were tracked 56 miles above the site.

So the short answer obtained from the study is that, yes, these species are traveling beyond the former dam site to spawn. But understanding the whole story requires a glimpse at the river's history and its distinctive geography.

On the River

Let's go back to that spring day on the Neuse when Waters and Farmer were surveying what is now considered primary spawning grounds for American shad. Our guide is Hightower.

We put in at Ferry Bridge near Goldsboro, about 10 miles upriver from the former Quaker Neck Dam site. It's a good morning to be on the river — early enough in the year that the air is still cool and the mosquitoes still sparse.

Just downriver from the bridge, Waters and Farmer are electrofishing for striped bass and American shad. Waters deftly maneuvers the boat, with its ungainly looking electrodes, near a fallen log in the river.

"Stripers like cover," Hightower explains. "A log is a perfect place to get stripers."

Yet it is feisty, glistening American shad, fleeing the electric current, that Farmer first scoops up with his net. He places them in a tank that recirculates water from the river. Next, a couple of stripers stiffen, surface and are added to the tank where they recover and begin to swim.

Before returning the fish to the river, Waters measures and weighs them, determines their sex and takes scale samples to determine the age, while Farmer records the data. They mark the tails of American shad with a holepunch so researchers will know when they encounter the same fish.

Striped bass, however, have scientific tags inserted. "That's because there are so few in the Neuse. On Monday, they got over 400 on the Roanoke. Here, we might get 200 in a season," Waters says. He explains that "the Roanoke has a stronger fishery due to restoration efforts" that included harvest restrictions and regulation of flow rates from Kerr Lake.

Using electrofishing to capture and tag American shad and striped bass is familiar to Hightower. He also used electrofishing in his post dam-removal study. The difference was that the fish were tagged with ultrasonic transmitters and monitored with telemetry.

Hightower and coresearcher Stephan Bowman, then a graduate student in zoology, tracked fish actively by boat with multidirectional antennas, and passively, with fixed telemetry stations both upstream and downstream of the former dam site. The advantage of his study, Hightower says, is that "you can get more information from an individual fish, but you might only have 10 or 20 fish with transmitters at any one time."

During the study, researchers plotted the locations of spawning activity using global positioning system technology. But as high-tech as the study was, one way to find spawning sites was to sit quietly in a boat in the evenings.

"Steve listened for splashing," Hightower says, explaining that splashing at the water surface is part of spawning behavior and one of the signs of spring on the river. "It's a real intensive period, then it's over. They're gone," he says.

Researchers noted differences in behaviors of bass and shad. "Striped bass are more dispersed in the river," he says. "There doesn't seem to be a well-defined spawning area in the Neuse."

Waters and Farmer move to a new sampling spot at a bend in the river where a clear, blackwater tributary meets the deeper, murkier Neuse. The river's banks are mud, rock and moss, with drifts of purple wildflowers. Here, stately cypress stand, their "knees" clutching the earth at the water's edge.

In lulls between frenzies of electrofishing, migratory birds, newly arrived from more southerly climes, make their presence known. The secretive cuckoo's somber, repetitive call is offset by the ringing melodies of the brown thrush and prothonotary warbler. It's a transitional time of year at a transitional place.

Hightower explains what makes the topography here unique. This is an intermediate area between the piedmont and coastal plain. Typically, such a change in gradient is called a fall line, but this is more of a zone than a line, he says.

"The fall line is important because the habitat changes there," he says. As the river approaches the coastal region from the piedmont, it becomes deeper and slower. The substrate also changes from gravel and cobble above the fall line to sand and silt below.

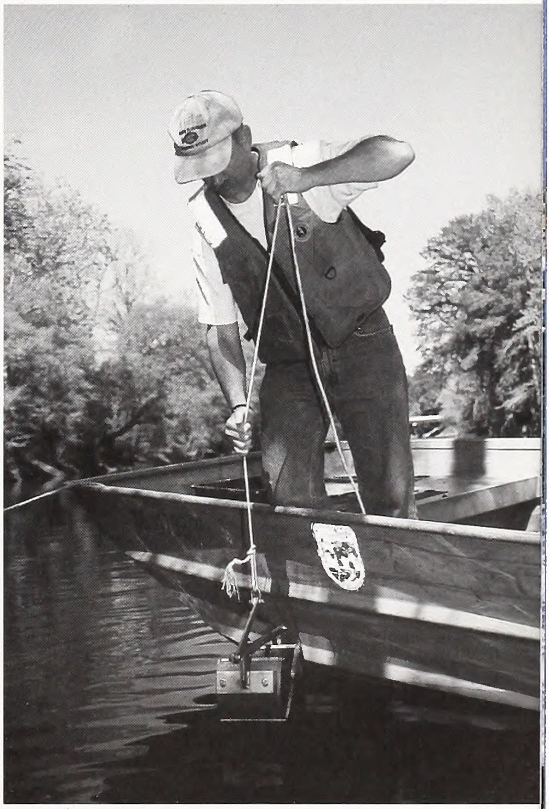
"The fall line is sort of ill-defined on the Neuse. It is much more clear-cut on the Roanoke, where the falls at Weldon clearly demarcate the transition between coastal plain and piedmont," Hightower explains.

By sampling the river bottom, Hightower's study illustrates why this area is different and why fish tend to migrate here. Below the dam, the substrate is mostly sand and silt — not ideal for spawning, Hightower explains.

"Gravel and cobble substrate seems to be what fish look for to spawn. Gravel is thought to be good protection for eggs. If the bottom is silty, eggs can suffocate," he says.

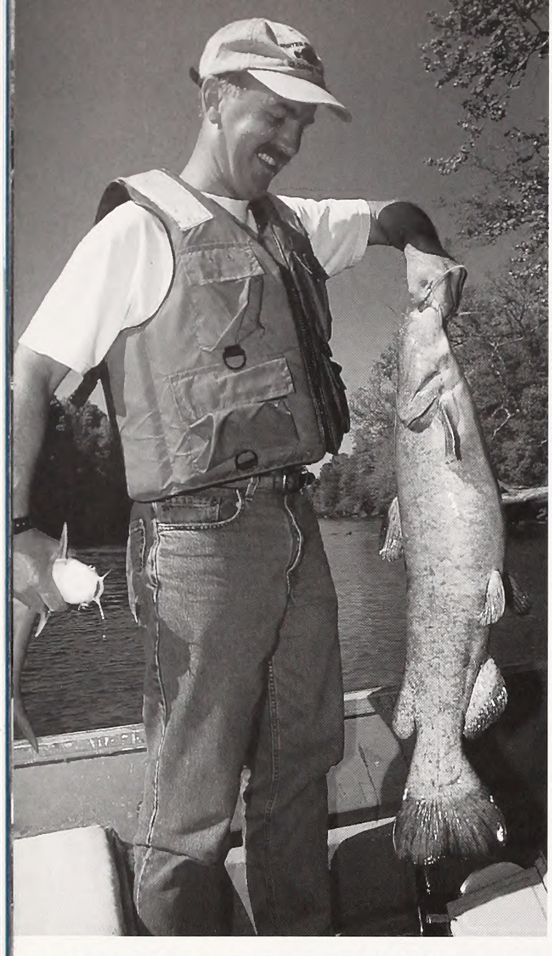
At the sampling area above the former dam site, the substrate changes to gravel and cobble. But above this spawning area, the substrate changes back to mostly sand until near Raleigh, Hightower says, and most USGS maps place the fall line in the Smithfield area.

"This looks like the next 100 miles," Hightower says, looking downriver. "If you didn't sample bottoms, you wouldn't know why they stop here."



TOP: Waters and Farmer collect scale samples to determine ages of fish.

BOTTOM: Hightower samples the river bottom.



TOP: Hightower displays a 30-pound flathead catfish, an introduced nuisance species.

BOTTOM: Farmer is poised to catch fish stunned by the electrofishing device.

The dam had been preventing shad and striped bass from reaching an area more conducive to successful spawning.

Past and Future

Every year, the small town of Grifton, on a tributary of the Neuse, celebrates a shad festival. While the celebrated fish is the smaller, bonier hickory shad, the festival hints at the importance of shad in North Carolina.

In *The Waterman's Song*, a history of black watermen in North Carolina, David Cecelski writes: "The largest fishery for plantation slaves lay on the lower Neuse, along the estuarine waters between New Bern and the Pamlico Sound. There shad fishing was a spring ritual for thousands of plantation slaves. …Dragnetting for shad, small gangs of slave fishermen moved up and down the Neuse, often staying in shoreside camps at night."

Few large commercial fisheries existed before the Civil War, but all that changed afterward — much to the detriment of the American shad. "In the later 1800s, they were just hammering these populations," Hightower says.

For striped bass, populations plunged through the 1970s and 1980s, resulting in strict harvest regulations. Many of these populations have recovered, Hightower says, although numbers on the Neuse remain low.

While more spawning areas are available for anadromous fishes, it will take time for their populations to grow. American shad leave the river when they are about six inches long and come back when they are sexually mature. "1999 was the first year the dam was removed," Hightower says. "That class (the first generation from the restored area) wouldn't come back for four or five years."

And just opening up river area does not ensure repopulation of these species. Much has changed since the antebellum days when, as Cecelski writes, "a good shad season could supply ample food and fertilizer for the entire year."

Development along the Neuse has brought increased demand for water above the fall line, while an ongoing drought has reduced the flow levels conducive to fish migration.

Predators in the Neuse have changed as well. Among the catch of Waters and Farmer that spring day was a monster — a 30-pound flathead catfish, an introduced nuisance species that, from the looks of it, may be the top of the food chain in this stretch of the Neuse.

Still, the problem of habitat quality is moot without habitat access.

Because the Quaker Neck Dam was in place for over 50 years, it's difficult to compare pre- and post-dam populations of fishes or to definitively point to cause-and-effect in declines in fish abundances, Hightower says.

Hightower gives as an example of effects of dams on anadromous fishes in the Susquehanna, a northeastern river that flows to the head of the Chesapeake Bay. When a dam was built 10 miles from the mouth of the river, "there was a complete collapse of the population," he says.

"With the Quaker Neck, it's not so clear-cut, but the fact that the fish are moving upstream to spawn makes us think (the dam removal) is going to be advantageous," he says.

"In 1997 to 1998 — the year the gates had been pulled but before the dam was removed — there was high water and the dam was completely submerged. Shad and striped bass made it all the way to Milburnie. That showed that fish would take advantage of this newly available habitat," Hightower says. Milburnie Dam is just below Raleigh, and is the next upstream impediment to migratory fishes on the Neuse.

"It is energetically expensive for these fish to swim upriver. If they're willing to swim all the way to Raleigh, there must be some kind of population benefit."

Now, with many miles of river reopened to migration, the energy expended by these migratory fishes may prove worth the effort. ◘

Land-use planning can help shape the future of coastal counties in North Carolina.

LAND-USE PLANNING: Coastal Counties Prepare for the Future

By Pam Smith
Photos by Scott T. Taylor

Statistics alone don't tell the story of growth along the coast. Yes, Brunswick County grew by a phenomenal 43 percent between 1990 and 2000. And Currituck and New Hanover counties leaped ahead by 32 percent and 33 percent respectively.

But for James Leutze, chancellor of the University of North Carolina at Wilmington, the reality of the population boom hit home during a flight along the coast from Charleston, S.C., to Wilmington. It was shocking, he says, to see so much coastal land covered with homes, shopping centers and other commercial buildings.

The scene was riveting to Leutze, a lifelong advocate of the coastal environment. In fact, it inspired the making of *Paving the American Dream: Southern Cities, Shores and Sprawl* for public television. The documentary, narrated by Leutze, focuses on the environmental, economic, historic and social impact of growth along the South Atlantic seaboard from Maryland to Florida.

Continued

> *"In the face of growth along the coast, it's in everyone's interest to plan and to be thoughtful and deliberate about how we use precious coastal resources. Planning is a valuable tool to help balance economic vitality with environmental sustainability."*
>
> James Leutze, chancellor of the
> University of North Carolina at Wilmington

Developers are finding new ideas and strategies to balance predicted growth with quality of life.

While the documentary lays out the ills of coastal urban sprawl — pollution, traffic congestion, loss of green space, degraded water quality, and diminished quality of life — it also explores ways to relieve pressures on coastal resources.

"In the face of growth along the coast, it's in everyone's interest to plan and to be thoughtful and deliberate about how we use precious coastal resources," Leutze says. "Planning is a valuable tool to help balance economic vitality with environmental sustainability."

Without sound planning, the very things that make the coastal communities desirable will be lost, he says. "We will have killed the proverbial goose that laid the golden egg."

New rules for coastal planning

Leutze sees the 1974 Coastal Area Management Act as a display of enlightened leadership to protect the state's coastal and marine resources.

CAMA authors created a state-local partnership giving the Coastal Resources Commission authority to require that each coastal county have a land-use plan to protect their environmental resources, explains Donna Moffitt, director of the state's Division of Coastal Management. DCM administers the commission's rules and regulations.

Last year, the CRC adopted revisions to land-use planning guidelines meant to streamline the process, provide more technical and financial assistance, and give local governments greater flexibility. In August, the new rules are scheduled to kick in.

"Land-use plans now can be better tailored to local governments' needs," Moffitt explains. "Clearly, it is in their best interest to create plans that help them control their own destinies. With blueprints for growth, each county or municipality can plan where they want to be and what they will look like in the future."

The CRC guidelines provide a common format and set of issues that must be addressed in the planning process. These topics include water quality, public access, land-use compatibility, infrastructure carrying capacity, natural hazard areas and local Areas of Environmental Concern (AECs).

Though not required by CAMA, many coastal municipalities also use the guidelines to develop land-use plans. Some plan jointly with neighboring towns. Some elect to adopt their county's plan.

Moffitt notes that for some counties and municipalities, the land-use plan is a jumping-off place for comprehensive resource management strategies or for developing local zoning ordinances.

Planning is an obvious necessity for the eight ocean-facing counties experiencing explosive growth. "They are looking to protect the very resources that attract people to their communities," she says.

CAMA counties that are not part of the boom may look to the land-use planning process to help spur economic development. The land-suitability analysis, for example, might help identify natural resources features that could attract ecotourism.

"Part of the planning exercise is to help people think about issues in the long term," says Courtney Hackney, CRC vice-chair and professor of marine biology at UNC-W.

Hackney remembers that land-use planning was simpler in the days before the massive migration to the coast. "But even then, objections were raised and the process was criticized. The fact is that land-use planning has prevented a lot of coastal catastrophes in recent years," he says.

Kathy Vinson, DCM planning manager, has seen a lot of changed attitudes through the years. "Fourteen years ago, eyes glazed over at the mention of land-use planning," she recalls.

But, as the character of the coast began to change, people began calling her. Vinson still is convinced that land-use planning is the coastal counties' best friend. "The public and elected officials know that land-use planning is especially critical now. If you don't plan, you may lose things you can't get back," she says.

That is not to say that the rules-change proposal didn't bring a barrage of complaints, Hackney adds. There are those who say land-use planning has no regulatory teeth. However, the state may "bite" by denying coastal development permits for any proposed project that is not consistent with the local land-use plan.

On the other hand, some critics, including the N.C. Homebuilders Association, charged that CRC had overstepped its statutory authority.

"Developers and the environment can

coexist," Hackney counters. "Bad ecology is bad economics and usually more costly if you take into account long-term water quality and quality-of-life issues."

Public participation essential

Getting the public involved in the planning process is a challenge, but essential. Citizen participation usually means that local plans go beyond the basic requirements. "Good local leadership is key," Moffitt says.

In Carteret County, a citizen steering committee has been working with county officials to develop a comprehensive plan. Assisted by planning experts from the Chesapeake Group, the Carteret plan is nearing completion. Crossroads, a local environmental organization, has been providing additional citizen backing and input. The process and support could give Carteret a running start in updating its CAMA land-use plan under the new guidelines.

In Onslow County, planner Michele Bunce is being resourceful in keeping the public's interest through the long planning process.

"From the beginning we wanted people to know that all aspects of their lives fold into wise planning," she says. "We've been looking at everything that impacts their lives from flood protection to transportation needs. We try to let them know that their input is vital. This is their county. They are planning for future generations," says Bunce. "We're about to wrap up our stakeholder meetings and draft a plan based on their input."

For nearly a year, Onslow citizens have been developing a comprehensive land-use plan. It will be the foundation of their CAMA plan. In fact, Onslow's land-suitability analysis served as a pilot study for the new CRC rules.

This meant looking at how development might impact environmentally sensitive areas in the county. Hardly a sector of the 756-square-mile county is without some unique natural feature. There is the Great Sandy Run Pocosin, Hoffman Forest, Intracoastal Waterway, Bogue Sound and White Oak River.

There's no getting around it. Much of Onslow's history, culture and economy are tied to the water. And, land use is tied to water use. So, protecting the county's many outstanding resource waters and shellfish waters means going beyond minimum efforts, Bunce says.

Onslow is collaborating with all municipalities in the county and Camp Lejeune on many common aspects of the comprehensive plan. Shared borders mean shared responsibility for protecting shared resources.

The planning process is an exercise that will produce important data for many uses, Bunce points out. The county and collaborating communities will use the data to prepare comprehensive stormwater management plans required by the U.S. Environmental Protection Agency.

"We all know that we are going to have to take a proactive planning approach and look for new methods of doing things because of new population pressures," says Bunce.

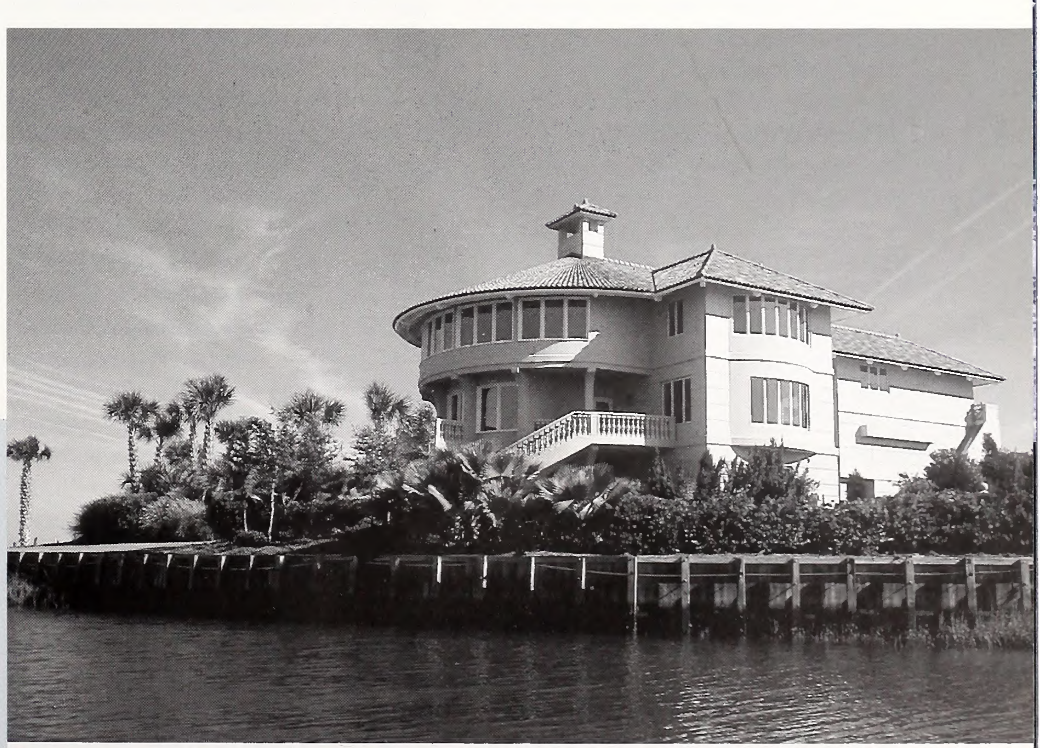
New ideas tested by fire

But Leutze knows that new ideas may not be embraced — even in otherwise progressive New Hanover County. A proposal to build a mixed-use development in the Middle Sound area caused more than just a little furor. Residents of a nearby subdivision held fast to a "not in my backyard" position. And Leutze came under attack for supporting the "smart growth" model designed to control suburban sprawl and growing traffic woes.

Continued

"Land-use plans now can be better tailored to local government needs," Moffitt explains. "Clearly, it is in their best interest to create plans that help them control their own destinies. With blueprints for growth, each county or municipality can plan where they want to be and what they will look like in the future."

Donna Moffitt, director of the state's
Division of Coastal Management



Five of the state's fastest-growing counties are on the coast.

"From the beginning we wanted people to know that all aspects of their lives fold into wise planning. We've been looking at everything that impacts their lives from flood protection to transportation needs. We try to let them know that their input is vital. This is their county. They are planning for future generations."

Michele Bunce, Onslow County planner

An abundance of clean rivers, streams and estuaries attract thousands of recreational paddlers to the state each year, contributing to a lucrative ecotourism industry.

Some residents demanded to know what right Leutze has to support such a proposal. After all, he doesn't live in their neighborhood.

The confrontation demonstrates a need to raise awareness of how "new urbanism" can fit into land-use planning for coastal counties. It also demonstrates a necessity to show that good planning is everyone's business, says Leutze.

"Public and private interests need not be at odds. We all have a stake in the wise use of resources. It's in everyone's interest to help preserve water quality," he says.

Surprisingly, the city council turned down the proposal — even though both the City of Wilmington and New Hanover County planning boards had recently adopted mixed-use zoning policies. What's more, the dissenting citizens didn't have to travel far to see a budding smart-growth community.

In nearby Brunswick County, Buddy Milliken is developing the Village of Woodsong, a mixed-use subdivison, near Shallotte. Its conservation design was guided by landscape architect Nancy White from North Carolina State University's College of Design.

Woodsong's design keeps natural systems functioning. A wetland helps maintain natural drainage patterns and effectively filters stormwater runoff. In addition, cisterns, courtyard ponds and grading are being used to slow down stormwater leaving individual homesites. And, says White, Woodsong's landscape standards will encourage the use of native plants, and man-made wetlands will provide habitat for wildlife.

White writes about Woodsong's innovations in a forthcoming publication *Protecting Estuarine Water Quality Through Design.* In it, White describes other landscape strategies that are compatible with — or go beyond — CAMA land-use goals and objectives. The guidebook is part of *The Soundfront Series*, produced by North Carolina Sea Grant in collaboration with DCM and the NC State College of Design. It is meant to help property owners, developers and planners reach sustainable development goals.

New levels of expectation

Meanwhile, Moffitt is encouraged by feedback from citizens and local officials from CAMA counties involved in land-use planning.

There is no question, she says, that the new rules are taking planning to higher levels of expectation. Local governments may choose from three levels of planning formats: a workbook plan for small towns; a core plan for all coastal counties and towns that have Areas of Environmental Concern (AECs); and an advanced plan for counties and towns that want to go beyond minimum state standards.

The rules require rigorous land-suitability analysis and establishing management objectives to guide local policies. Local governments will be able to use the analysis to meet requirements for other planning programs, such as the EPA Phase II Stormwater Management Plan.

A revised grant-funding system encourages local governments to work jointly to develop and implement plans.

"I see a level of sophistication in counties that have been doing serious land-use planning," Moffitt says.

"CAMA counties are far and away better off than same-sized counties in other parts of the state not required to do land-use plans. Their skills are much better, and they have a better sense of self and community. In the long run, the well-being of our counties is at stake. Good land-use planning goes directly to the health, safety and welfare of the community." ◘

Copies of Paving the American Dream *are available from UNC-W. The documentary is the centerpiece of a Web site developed as an educator's resource on smart growth. Log on at* www.uncwil.edu/smartgrowth/ *or call 910/962-2650 for additional information.*

For information about land-use planning in CAMA counties, go online to www.nccoastalmanagement.net.

Ahoy! All Aboard for Coastal Adventures

By Robin Sutton

Now that the days are longer and the sun is warmer, end-of-grade tests are a thing of the past. It's time to exchange waking up early to catch the bus with enjoying your bed for just a little bit longer. Best of all, homework can be replaced with early-evening lightning bug hunts.

For some kids, family trips to the beach are in store. For others, camp is waiting with new friends and endless activities on the water.

But if going to the beach, sailing or fishing at the shore aren't on your summer calendar, there are other ways to enjoy coastal adventures.

We offer a summer reading list that provides opportunities to experience the coast. There are children's stories about history and recipes for delicious seafood. And, you don't even have to move from the lounge chair at the neighborhood pool or the kitchen in your own home to enjoy the adventures.

SEABISCUIT, WILD PONY OF THE OUTER BANKS, *by Anne Russell, Coastal Carolina Press, 25 pages. Hardback, $14.95, ISBN: 1-928556-28-0.*

The beautiful ponies that dwell on several of the banks of North Carolina's coast are awe-inspiring — not only because of their grace, but also because of their freedom, bound only by the ocean.

During a visit to Shackleford Banks, Anne Russell witnessed these ponies and was inspired to write *Seabiscuit*. It's the story of one of the ponies that lives on the Outer Banks with her father, Nautilus, and her mother, Angel Wing.

Seabiscuit has been taught from birth how precious her freedom is. "Your life is your very own," her mother always told her. Seabiscuit can run all over the banks and eat anything she likes. She can chase sandpipers and watch great ships and sailboats pass by. On hot days, she may swim through the waves. "We are lucky to be free," her father says.

But one day, her surroundings change suddenly as a hurricane approaches the banks.

Only when the sky turns dark and the ocean waves crash much higher than usual does Seabiscuit learn to appreciate her freedom. To keep it, she must be responsible for herself.

Though her book is geared toward children ages three to eight, readers of any age will learn from Russell's simple storyline. Beautiful watercolor paintings by Diane Royder Halpin and borders by Brooks Pierce cover each page and illustrate the beauty of Seabiscuit's home on the banks — and the value of the wildlife there.

Seabiscuit
Wild Pony of the Outer Banks
by Anne Russell
Original illustrations by Diane Royder Halpin with borders by Brooks Pierce

PRINCEVILLE: THE 500-YEAR FLOOD, *by Carole Boston Weatherford, Coastal Carolina Press, 32 pages. Hardback, $14.95, ISBN: 1-928556-32-9.*

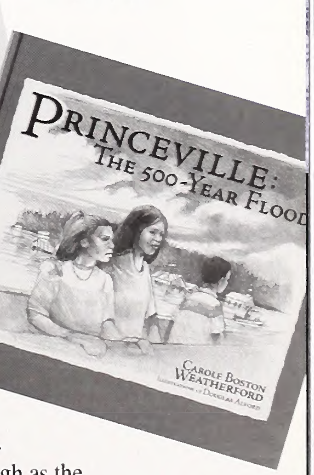
In Carole Boston Weatherford's touching story of a family living in Princeville during Hurricane Floyd, she reminds us that even though a flood may take away our buildings and cars, it can't wash away our history.

Through the eyes of Jimmy, Lavada and their mother, Weatherford tells her readers how the rising waters of Hurricane Floyd affected the people of Princeville.

Just after the major winds of the storm hit, it seemed that the brunt of the storm was over, and their town beside the Tar River would be safe. Thankfully, all that was left of the storm was rain. But nobody could have guessed just how much rain there would be.

It wasn't long before Jimmy, Lavada and their mother had to leave their home with just a few bags. Their photographs and countless memories would have to stay behind, as the rising waters forced them to move into a crowded school gym in another city to stay for several weeks.

Their home was under water for almost two weeks. The flood rose 23 feet, as high as the



Continued

traffic light. When they were finally able to return home, they discovered that the walls, floors and windows were demolished.

More than 850 Princeville homes were destroyed, and almost 2,000 people were left homeless. The children missed nearly a month of classes.

When Lavada is sent to a new school temporarily, she draws a picture of her mom, Jimmy and herself standing in front of their destroyed home. At the top she writes, "We still have each other."

The people of Princeville have been sharing this attitude for many years. The town was established in 1885 as the first founded and governed by former slaves. Their heritage is important. Weatherford shows that when the people of Princeville are faced with the choice of saving their community or moving to higher ground, they have an important decision to make.

Douglas Alvord's thoughtful illustrations will remind the townspeople of Princeville — and many other eastern North Carolina communities — of Lavada's words, "We still have each other."

THE NIGHT FLYERS, *by Elizabeth McDavid Jones, Pleasant Company Publications, Middleton, WI 53562. 139 pages. Hardback, $9.95, ISBN: 1-56247-815-X.*

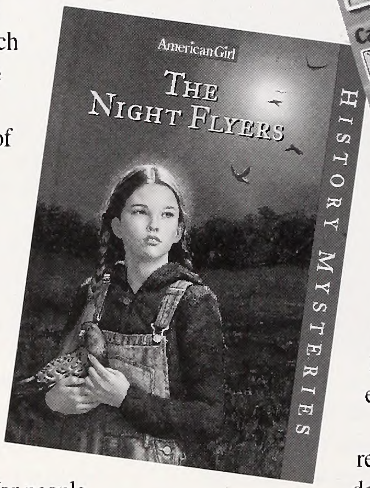
World War I is a time of uncertainty for 11-year-old Pam Lowder. With her father overseas fighting in World War I, nothing is the same at home in Currituck. And, Henry Bagley, her bratty classmate, seems to make life impossible for her at school.

Her spelling lessons are suffering because of all the extra time she has to spend helping out at home, and she feels that her life is overturned since her dad's absence. Yet, Pam's mother reminds her of a special talent: "Who else has a loft of pigeons that will home at night in the worst of weather?"

Indeed, Pam and her father have raised the best homing pigeons on the North Carolina coast — homers with the rare ability to fly at night.

When a strangely dressed man with a thick foreign accent moves to Currituck, the whole town starts talking. Could the mysterious man be a German spy? And what's more, he wants to buy *Pam's* pigeons!

When Pam declines his offer, her pigeons suddenly begin to disappear. The search for them leads her to a far more elaborate adventure than she could have ever set out to find – one which teaches her greater lessons than the ones in her spelling book.



Night Flyers was the winner of the 2000 Edgar Allan Poe award for best juvenile mystery. The book is a part of the popular American Girl collection's History Mysteries line. It was voted "favorite new series" by children's booksellers in a recent *Publishers Weekly* survey. Following the conclusion of Jones' story, an illustrated essay teaches readers what life was like for people living in a town like Currituck, as well as for the soldiers off fighting for their country.

BLUE CRABS: CATCH 'EM, COOK 'EM, EAT 'EM, *by Peter Meyer, Avian-Cetacean Press, Wilmington, NC 28408. 128 pages. Paperback, $13.95, ISBN: 0-9628186-3-1.*

When dining out, it seems like menu items with crabmeat are the tastiest — and the most expensive and elaborate. Meyer takes away the mystery of crabbing and adds intrigue, not only explaining how easy and fun crabbing can be, but making it accessible to children.

"Crabbing, especially crabbing with children, is more than just inexpensive entertainment," he says. "Crabbing educates youngsters, too. When children (and adults) go crabbing, they learn respect for the wonders of nature. They also acquire the ability to provide food for the table, and they can even become proficient at cooking the family's food."

Meyer divides his guide into three sections, where readers of any age can learn six different ways of catching blue crabs, a few simple methods of cooking them, and more than 25 different ways to eat them.

Walking his readers through every detail, Meyer gives personal anecdotes about his family and offers insider tips. In one of the many photographs, he kisses a fish before tossing it into the crab trap for bait. "Smooching the bait before placing it in a crab trap is said to generate a good harvest of blue crabs," Meyer explains.

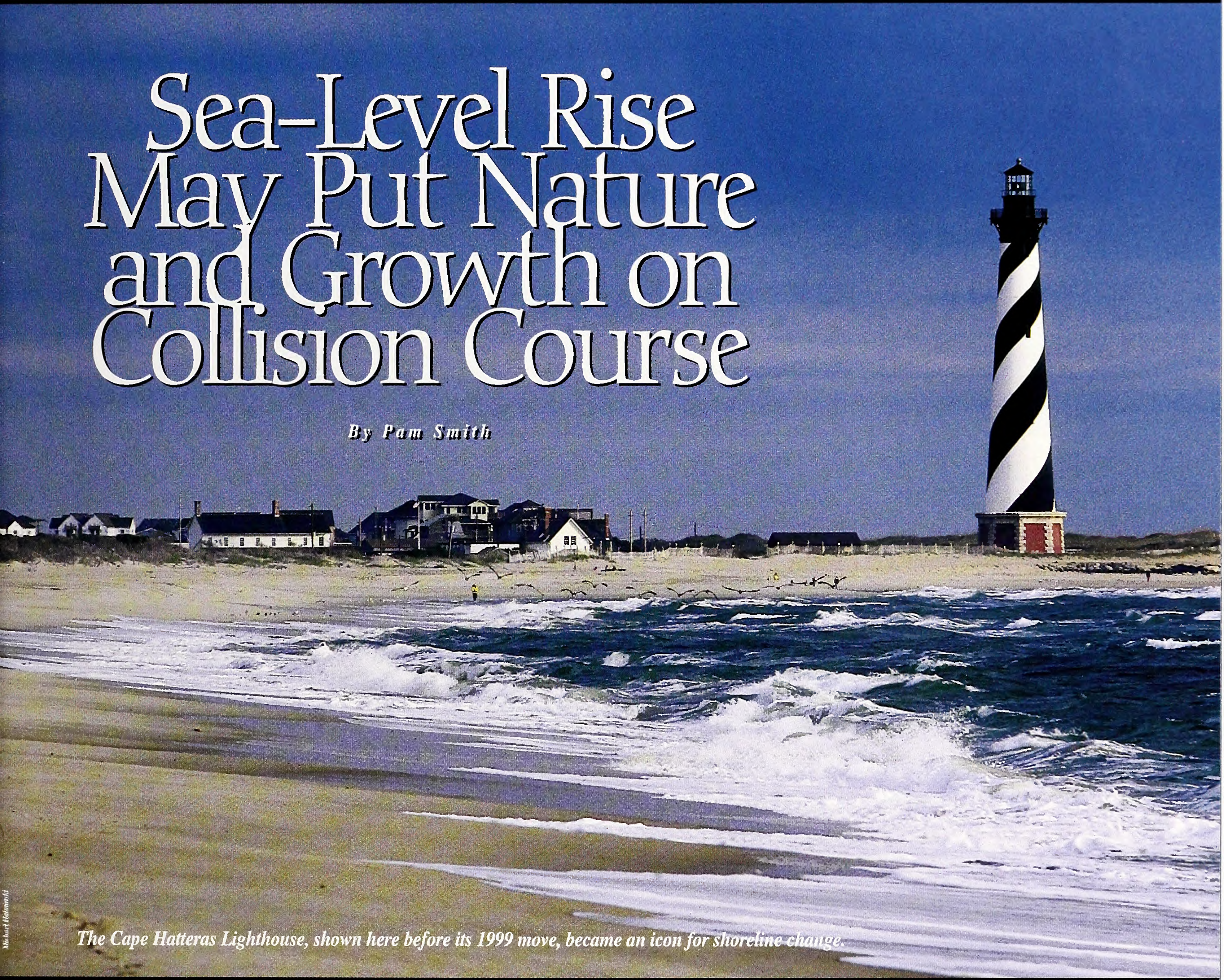
After offering detailed, yet simple instructions telling how to prepare and cook the crabs, he gives recipes ranging from crab omelets for breakfast to seafood gumbo for dinner.

Meyer ends his book with more illustrations and interesting clips of information on the crab's life cycle, anatomy, defense mechanisms, reproduction and prey, as well as information on commercial crabbing methods.

He supplements his passages with lots of photographs and drawings. Seeing the expressions of enthusiasm on the kids' faces as they catch the crabs — as well as the looks of satisfaction as they eat them — will make even the crabbiest person want to run out to the dock with fresh bait and a trap. ◘

Sea-Level Rise May Put Nature and Growth on Collision Course

By Pam Smith



Michael Halminski

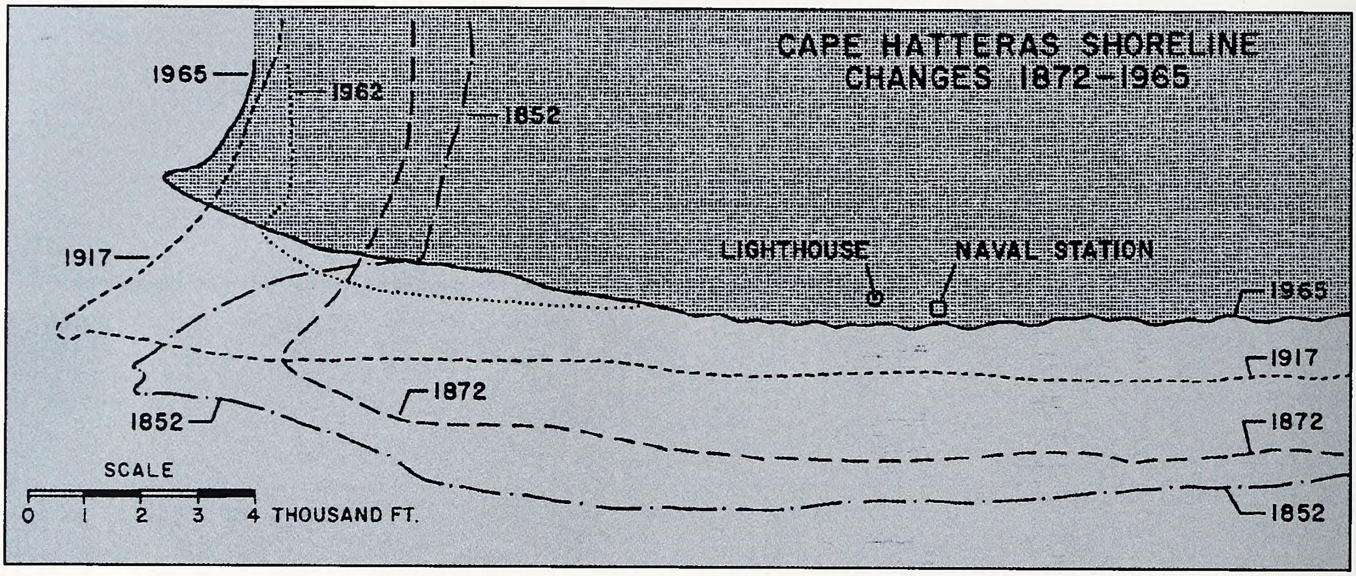
The Cape Hatteras Lighthouse, shown here before its 1999 move, became an icon for shoreline change.

Sea-level rise.

The phrase is likely to evoke a mixed reaction at any politically diverse social gathering. Some may say it's an issue that needs to be taken seriously. Others will claim it's a notion fabricated by antidevelopment advocates.

Scientists say that global warming is causing expansion of ocean waters and glacial melting — factors contributing to the rising sea levels. But, the scientific community itself is divided about the rate seas will rise over the next century. There seems to be consensus, however, that sea level will have to be accommodated — one way or another.

Continued



The map of ocean shoreline change from 1852 to 1965 by John Fisher of North Carolina State University demonstrates the recession of the ocean beach at Cape Hatteras.

Or, more to the point, the rising sea will accommodate *itself* one way or another. That's precisely what land-use planning in coastal counties needs to take into account to keep people and structures out of harm's way, says Walter Clark, North Carolina Sea Grant coastal and marine policy specialist.

"Still, it's difficult to get the public to take a long-term view," he says. "Nature's processes are slow, occurring over generations of time. Whereas, human responses tend to be short-term fixes."

In North Carolina, the 20 coastal counties within the regulatory authority of the state's Coastal Area Management Act are required to have land-use plans.

While CAMA guidelines recognize that local governments need to be addressing sea-level rise, few plans reflect even minimum predictions of the rising sea, Clark says. In fact, a study of land-use plans Clark conducted for the U.S. Environmental Protection Agency showed that most plans historically have ignored the issue.

But such an oversight could be costly, considering that North Carolina has nearly 350 miles of ocean beaches and more than 1,700 miles of estuarine shoreline that form narrow barrier islands and a low-lying coastal plain. Much of this area is less than 20 feet above mean sea level, and a large percentage is less than five feet above mean sea level.

Given these topographical facts, coupled with dramatic population increases along the coast over the past two decades, it's clear to see why North Carolina should be planning for long-range impacts of sea-level rise, Clark observes.

"A rising sea level could have a significant environmental, social and economic impact on the state," he says.

A scientific view

From a scientific perspective, climate change and sea-level rise is an old story, says Stanley R. Riggs, distinguished professor of geology at East Carolina University.

Author of a forthcoming Sea Grant/Division of Coastal Management publication, *Shoreline Erosion in North Carolina's Estuaries,* Riggs explains that the history of North Carolina's coastal system begins between 20,000 and 10,000 years ago. Massive ice sheets of the Pleistocene glacial epoch covered the northern half of North America. The North Carolina coastal system was located below the edge of the continental shelf, or about 10 to 60 miles seaward of — and 400 feet lower than — the present shoreline.

As the glaciers began to melt and recede in response to the warming climate at the end of the Pleistocene, some 10,000 years ago, the meltwaters began to raise global sea level and generally migrate upward and westward throughout much of the modern Holocene epoch. The estuaries formed as the rising sea flooded the topographically low river and stream valleys.

Data suggest that sea level is rising at about 1.1 feet per century in the Charleston, S.C., area and about 1.4 feet per century in the Norfolk, Va., area. Limited data for the intervening coastal region suggest it may be rising slightly faster, at about 1.5 feet per century, Riggs says.

As glacial ice in Antarctica and Greenland continues to melt in response to global warming, the ongoing rise in sea level will slowly flood the state's coastal lands, Riggs says. And, if sea level continues to rise at either the present or greater rate, and the number and magnitude of storms that have characterized the 1990s continues or increases, he envisions a very different coastal configuration by the end of 2200.

For modern day evidence of coastal dynamics at work, Riggs points to the Outer Banks, where large segments of the barrier island already are collapsing. This is demonstrated, he says, by the lack of space to maintain a viable roadway along certain sections of N.C. 12.

North Carolinians also might look to the slow and steady migration of the shoreline at Cape Hatteras. Extensive shoreline change in 113 years ultimately led to the decision to move the Cape Hatteras Lighthouse nearly 3,000 feet away from the advancing sea in 1999.

No solitary voice

Riggs is no solitary scientific voice in the wilderness.

In 2001, the Intergovernmental Panel on Climate Change, a United Nations scientific body on global warming, reported that an increased rate of sea-level rise would adversely impact coastlines in North Carolina, Maryland, Florida and Louisiana with accompanying:

- accelerated rates of coastal erosion and land loss
- increased economic losses due to flooding and storm damage
- total collapse of some barrier island segments
- increased loss of estuarine wetlands
- saltwater intrusion of groundwater supplies

Scientists on the panel, including Jim Titus, the director of EPA's Sea-Level Rise project, warned that elsewhere, some small island nations and countries close to sea level would be most vulnerable.

The scientific community is grappling to understand the connections and controls between an increase in global warming and the rate of sea-level rise. Some scientists say that pollutants that trap the sun's heat in the Earth's atmosphere contribute to global warming.

While scientists are discerning cause and effect, Clark sees room for citizens, state agencies and elected officials to begin developing strategies to deal with sea level rise.

"What is hotly debated is whether human activities are accelerating the processes, and whether a reduction in so-called greenhouse gas emissions can slow down the effects of global warming. This is a likely stepping-off place for discussion," he observes.

Accommodating sea-level rise

Clark believes that long-range planning holds the key to mitigating the negative effects of natural forces. He looks to the DCM land-use planning process as an opportunity to move the sea-level issue to a higher priority in considering development near ocean or estuarine shorelines.

Along with required CAMA county planning, local governments can be proactive in adopting land-use ordinances that take into account the long-range effects of sea-level rise on lands adjacent to wetlands, rivers or estuaries.

> Scientists say that global warming is causing expansion of ocean waters and glacial melting — factors contributing to the rising sea levels. But, the scientific community itself is divided about the rate seas will rise over the next century. There seems to be consensus, however, that sea level will have to be accommodated — one way or another.

The Coastal Resource Commission's setback requirements protect oceanfront structures. In 1999, the CRC established a 30-foot vegetated buffer requirement along some nonocean shorelines to protect the estuarine water quality.

Unlike the oceanfront management regulations that are based upon the dynamic interplay of land and water, current estuarine shoreline guidelines presume that these shorelines and their natural systems are basically static, and not responding to sea-level change. Consequently, Clark points out, the CRC rules provide little protection to fringe estuarine wetlands migrating upland.

Now, DCM is taking a closer look inland to begin planning for changes that will occur due to sea-level rise. Audra Luscher, a Coastal Management/Sea Grant fellow, is working with division staff, other state agencies, and a team of scientists to gather information.

Among other things, she will help identify low-lying coastal land that could be established as wetland migration corridors. The ability of a wetland to migrate upland with a rise in sea level depends on shoreline development.

Recommendations from Luscher's study could provide scientific justification for revising estuarine shoreline stabilization rules to protect the public from risks of flooding.

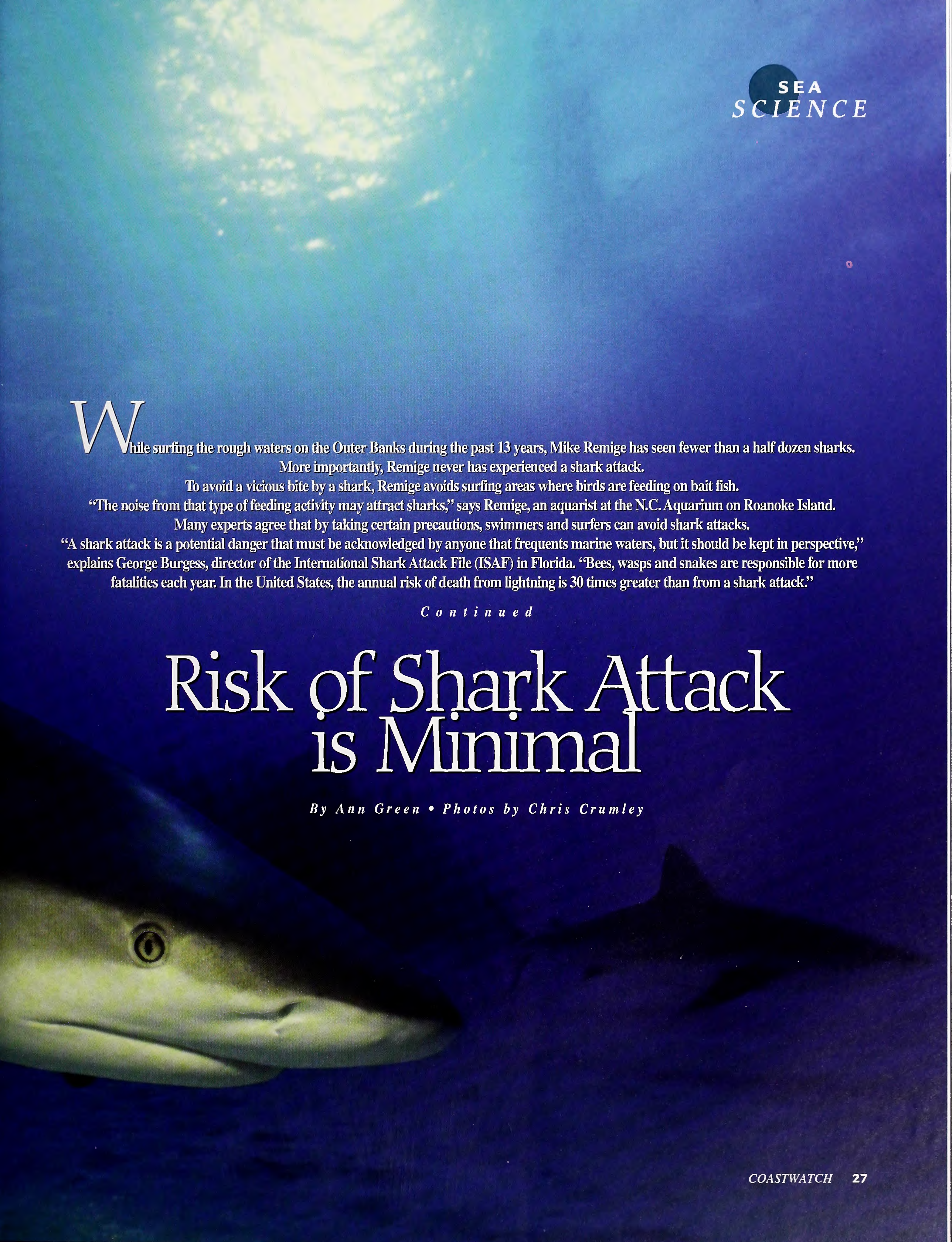
But state rules and regulations and local ordinances are not the only methods to consider, Clark says.

For example, The Nature Conservancy of North Carolina is working with EPA to develop models to manage preserves and other conservation lands that are likely to be impacted by future sea-level rise effects, from strong tides and salt spray to submersion.

Land protection strategies include rolling easement and timber management easement agreements with landowners, says the Conservancy's Sam Pearsall. With a rolling easement, the landowner may agree to maintain a natural shoreline to help absorb the energy of rising water levels.

With a timber management easement, the landowner may agree to manage the timber crop until the rising water level reaches the trees. In addition, the landowner may agree to replant with species, such as bald cypress, that are resilient to salt water. The cypress also would help hold soil in place as water levels advance.

While there are no one-size-fits-all strategies, Clark is optimistic that "the collective wisdom of citizens, government and nonprofit agencies can work toward preventing a collision between rising sea level and the public good."



While surfing the rough waters on the Outer Banks during the past 13 years, Mike Remige has seen fewer than a half dozen sharks. More importantly, Remige never has experienced a shark attack.

To avoid a vicious bite by a shark, Remige avoids surfing areas where birds are feeding on bait fish.

"The noise from that type of feeding activity may attract sharks," says Remige, an aquarist at the N.C. Aquarium on Roanoke Island.

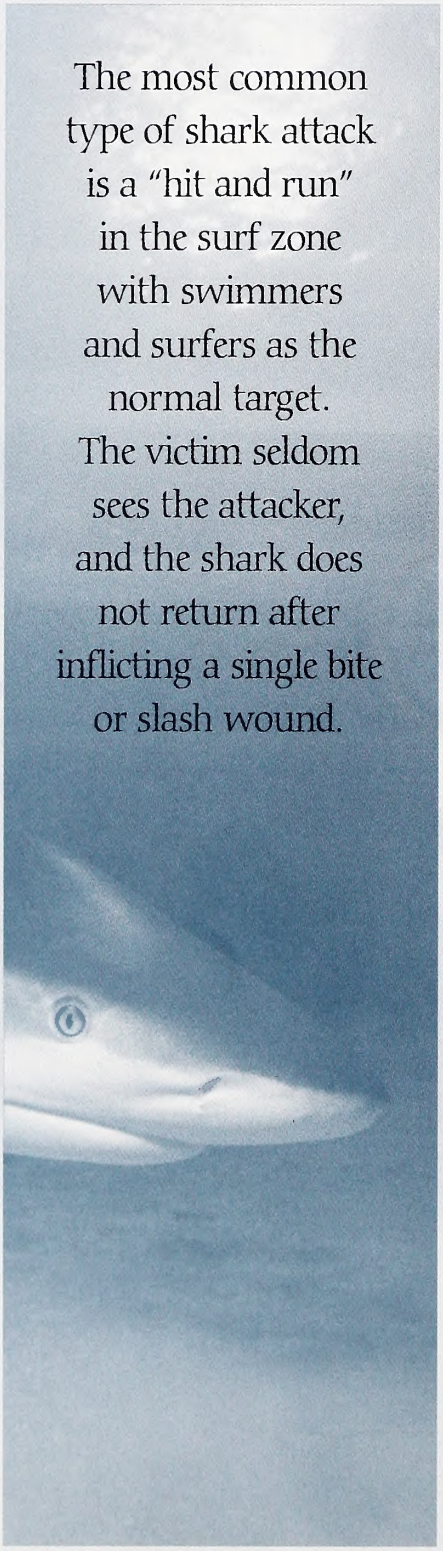
Many experts agree that by taking certain precautions, swimmers and surfers can avoid shark attacks.

"A shark attack is a potential danger that must be acknowledged by anyone that frequents marine waters, but it should be kept in perspective," explains George Burgess, director of the International Shark Attack File (ISAF) in Florida. "Bees, wasps and snakes are responsible for more fatalities each year. In the United States, the annual risk of death from lightning is 30 times greater than from a shark attack."

Continued

Risk of Shark Attack is Minimal

By Ann Green • Photos by Chris Crumley



> The most common type of shark attack is a "hit and run" in the surf zone with swimmers and surfers as the normal target. The victim seldom sees the attacker, and the shark does not return after inflicting a single bite or slash wound.

Although the odds of a shark bite are low, a series of shark attacks last year in U.S. waters created fear among beachgoers.

The attacks, including one on the Outer Banks last fall, generated intense media coverage that created the perception that 2001 was a banner year for shark attacks.

However, Burgess says that data indicate that attack numbers for the United States were almost identical to those of the previous year — 54 in 2000 and 55 in 2001. The international total of 76 in 2001 was 11 percent lower than in 2000, when there were 85 attacks. More importantly, the number of serious attacks, as measured by the fatality rate, was less than half of that over the last decade, says Burgess, a Florida Sea Grant researcher.

"The number of shark attacks has been rising throughout the past century as a result of human population growth and concurrent rises in aquatic recreation," says Burgess. "Greater efficiency in ISAF recording in recent years also has contributed to rises in recorded attack totals."

East Coast Shark Populations

Shark attacks also have been interlinked with fishery management and conservation efforts. In 1993, NOAA Fisheries implemented a fishery management plan for sharks, which set shark harvest limits in commercial and recreational fisheries. The plan also included data collection programs, permitting and reporting requirements, bycatch reduction of sharks in all fisheries, and promoting sea safety for shark fishers. The measures apply to sharks in the Atlantic Ocean, Gulf of Mexico and the Caribbean Sea.

"The East Coast shark population is not in recovery, based on NOAA Fisheries 1998 assessment," according to Margo Schulze-Haugen, fishery biologist in the Highly Migratory Species Management Division of NOAA Fisheries headquarters. "The measures put into effect will require 30 to 40 years to rebuild large coastal shark species."

Because of severe biological limitations, shark populations grow slowly and reproduce at low rates, according to Robert E. Hueter, director of the Center for Shark Research at Mote Marine Laboratory in Sarasota, Fla.

Sharks do not spawn thousands or millions of eggs like bony fish cousins. When they reach adulthood — which may take a dozen years or more in some species — sharks mate just like mammals, and the females get pregnant and carry their growing young inside them.

"So in many ways, sharks reproduce more like ourselves than the other fishes," says Hueter. "And unlike other fishes, sharks cannot produce lots of young quickly to replenish an area depleted by overfishing. When sharks are overfished, the stocks can remain in a depleted state for decades after fishing has ceased, simply because it takes that long for these animals to grow and produce a new generation."

NOAA and the Panama City Laboratory's Shark Population Assessment Group at the U.S. Department of Commerce have extensive shark population data.

Sharks, which are "top predators," play an important role in the ocean and are typically at the top of marine food webs.

"This ecological role of sharks in the oceans is very important, similar to that of the big predators on land," says Hueter, past president of the American Elasmobranch Society. "As top predators, sharks affect all the levels below them, and there are few other species that can take their place if sharks are removed."

Numerous Shark Species

More than 400 different species of sharks inhabit the world's oceans.

In North Carolina, more than 50 species are known to swim in estuaries and ocean waters, according to *Sharks, Sawfish, Skates and Rays of the Carolinas* by Frank J. Schwartz, a University of North Carolina Institute for Marine Sciences researcher. However, only a few of these species are dangerous for swimmers, surfers and divers.

Along the North Carolina beaches and across the East Coast, the number one species for biting is the blacktip shark (*Carcharhinus limbatus*), which has black tips on its pectoral fins and grows to no more than about six feet.

Other species that bite include the spinner shark (*Carcharhinus brevipinna)* — also known for its black-tipped fins and recognized by its long snout.

Smaller species that swim close to shore are the blacknose shark (*Carcharhinus acronotus*), which has a black/dusky smudge on the top of its snout, and the Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), distinguished by its long, thin shape and sometimes whitish spots on its body.

The most dangerous shark in surf areas along the southeastern coast is the bull shark (*Carcharhinus leucas*), which is recognized by its short, broadly round snout, small eyes and subtriangular serrated teeth. This species grows up to nine feet long and feeds on large prey.

"Bull sharks come into estuaries and fresh water," says Hueter. The bull shark was responsible for the attack last July of an 8-year-old a few feet from the shore in the waters off Pensacola, Fla.

Where do most shark attacks occur? Usually, in nearshore waters, typically inshore of a sandbar or between sandbars, where sharks feed and can become trapped at low tide. Areas with steep dropoffs also are likely attack sites. Sharks congregate there because their natural food items also congregate in the area.

Types of Shark Attacks

The most common type of shark attack is a "hit and run" in the surf zone with swimmers and surfers as the normal target. The victim seldom sees the attacker, and the shark does not return after inflicting a single bite or slash wound.

"Bump and bite" attacks and "sneak" attacks, while less common, result in greater injuries and most fatalities. These types of attacks usually involve divers or swimmers in somewhat deeper waters, but also occur inshore in some areas of the world. "Bump and bite" attacks are characterized by the shark initially circling and often bumping the victim prior to the actual attack. "Sneak" attacks differ in having the attack occur without warning.

In the United States, two-thirds of the attacks occur in Florida's Volusia County, which includes Daytona and New Smyrna beaches, according to the ISAF.

"The large number of incidents is attributable to very high aquatic recreational utilization of its attractive waters by Florida residents and tourists, especially surfers," says Burgess, director of the Florida Program for Shark Research at the University of Florida.

Last year, one swimmer was killed and another injured at Avon on the North Carolina Outer Banks. From 1991 to 2001, there were 13 unprovoked shark attacks in North Carolina waters, including the one fatality, according to the ISAF.

Although the relative risk of shark attacks for humans is very small, swimmers and surfers can help prevent attacks by remembering Hueter's simple slogan: "Between the months of five through nine, go swimming in the ocean from nine to five."

In other words, from May through September, swimmers and surfers in the southeast can minimize their risk by waiting until well after dawn (after 9 a.m.) to enter the water and getting out well before sundown (by 5 p.m.).

Large sharks are more active during twilight periods and at night when they have less visual information to go on. ◘

How to Avoid Shark Attacks

As swimmers or surfers hit the water, the International Shark Attack File (ISAF) offers tips for avoiding sharks:

- Always stay in groups because sharks are more likely to attack a solitary individual.
- Do not wander too far from shore because this isolates an individual and places one far away from assistance.
- Do not enter the water if bleeding from an open wound or menstruating because a shark's sense of smell is highly sensitive.
- Avoid wearing shining jewelry because reflected light resembles the sheen of fish scales.
- Use extra caution when waters are murky, and avoid uneven tanning and bright-colored clothing because sharks see contrast particularly well.
- Refrain from excessive splashing, and do not allow pets in the water because of their erratic movements.
- Remember that sightings of porpoises do not indicate the absence of sharks — both eat the same food.
- Exercise caution when occupying the area between the sandbars or near steep drop-offs where sharks hang out.
- Do not enter the water if sharks are known to be around, and evacuate the water if any sharks are seen.
- Do not harass a shark.

For more information about sharks, visit the ISAF Web site: *www.flmnh.ufl.edu/fish/Sharks/ISAF/ISAF.htm*

Sea Grant

NORTH CAROLINA SEA GRANT
NORTH CAROLINA STATE UNIVERSITY
BOX 8605
RALEIGH, NC 27695-8605

ADDRESS SERVICE REQUESTED

PERIODICALS
POSTAGE PAID
AT RALEIGH, NC

COASTWATCH

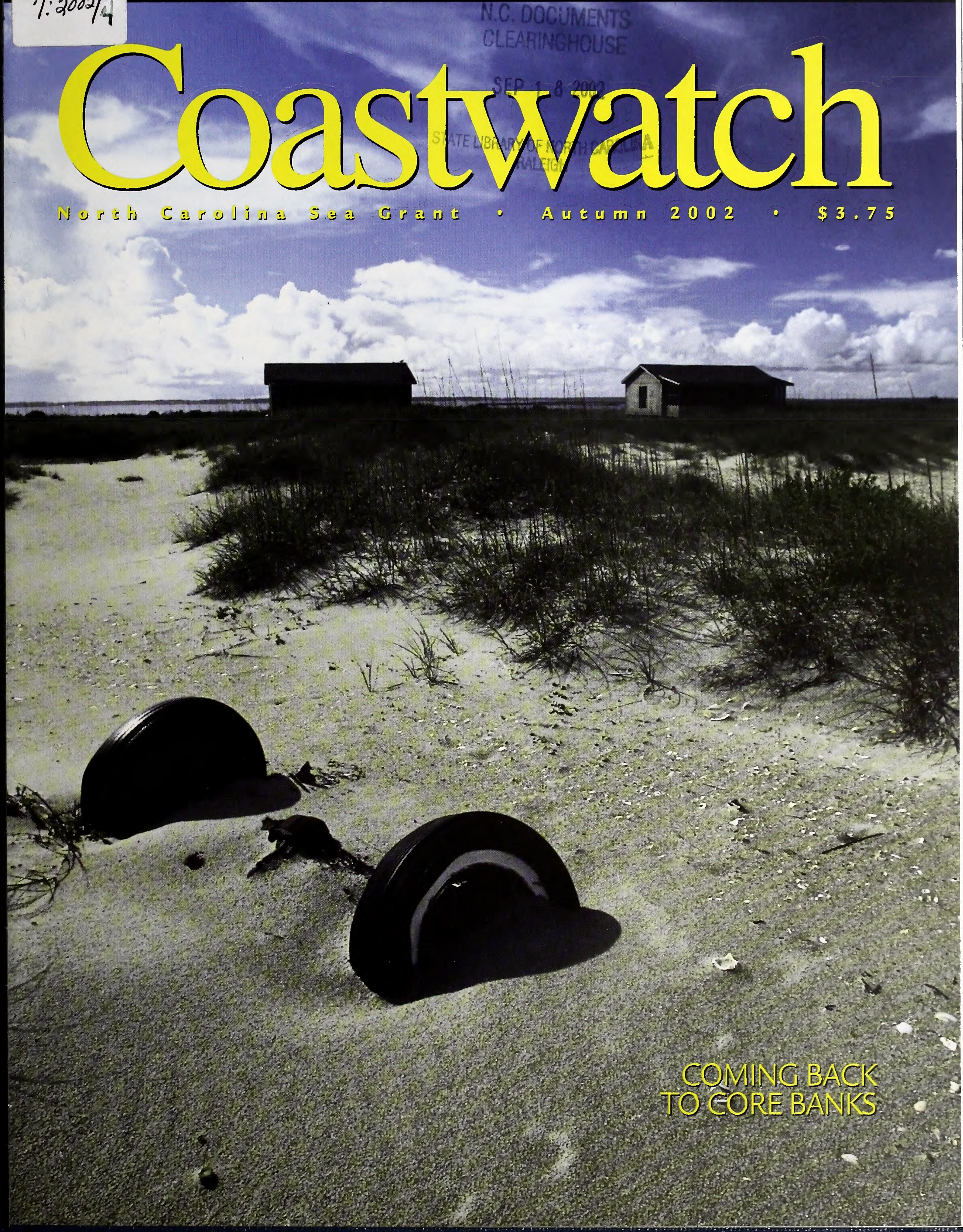
G69
7:2002/4

AM RESTORATION • JELLYFISH • QUALITY SEAFOOD

N.C. DOCUMENTS
CLEARINGHOUSE
SEP 18 2002
STATE LIBRARY OF NORTH CAROLINA
RALEIGH

Coastwatch

North Carolina Sea Grant • Autumn 2002 • $3.75



COMING BACK
TO CORE BANKS

FROM THE EDITOR

Whale Watch

Herman Lankford

OK, here's a test. What do you do if you are on a boat and spot a whale tangled in fishing gear?

The proper response is to radio a report to the Coast Guard immediately, then simply stand by until trained help arrives.

In fact, taking matters into your own hands could make things worse. That was the case in July for an endangered right whale — known as RW 1427 and nicknamed "Polaris."

A male whale about 50 feet long and 18 years old, Polaris was spotted off the New Jersey coast with fishing gear trailing behind. With a total population estimated at only 300, right whales are individually identifiable by marine mammal experts.

At the first report of entanglement, the East Coast whale network kicked into action under the leadership of the Center for Coastal Studies (CCS) in Massachusetts, the U.S. Coast Guard and the National Marine Fisheries Service.

Experts from CCS were able to trim part of the gear and attach a telemetry buoy to the remaining gear. The buoy allowed CCS to track the whale while a more detailed rescue plan could be developed.

Polaris kept heading south. Choppy seas made monitoring his path difficult, but the whale was spotted later off the coast of Virginia Beach, still heading south. The whale network received reports from various sources — including a sighting from a person on a Kitty Hawk pier.

Officials got aerial views of the whale off the Outer Banks, as well as views from a Coast Guard vessel. On July 17, a charter boat called in a sighting near Diamond Shoals, southeast of Hatteras. The boat was standing by for the Coast Guard and "first responder" Bill Foster of Hatteras.

But before Foster could arrive, another charter boat made a "well-intentioned but misguided" effort to help the whale — and cut the line that held the telemetry buoy.

This happened despite frequent Coast Guard broadcasts warning vessels about the situation. Also, federal regulations prohibit approaches to right whales within 500 yards.

Without the telemetry, the network had to rely solely on sightings of Polaris as he continued south, past South Carolina and Georgia.

While this case took a frustrating turn off the North Carolina coast, there is a bit of a silver lining — emergency gear and trained whale network responders are right here on our coast, thanks to the Fishery Resource Grant program.

Several years ago, Foster's FRG project established a North Carolina disentanglement network. Some responders — including scientists from the Duke Marine Laboratory — earned special certification to approach endangered whales. CCS also provided lower-tier response training to representatives of the fishing community and state and federal agencies.

The grant also provided "emergency kits" at Oregon Inlet and Fort Macon Coast Guard stations. Known to the network as "caches," the kits include inflatable boats, telemetry buoys and special cutting tools to release fishing gear without injuring the whale.

So, if you see a whale in trouble, call the Coast Guard and give your location. You should "stand by" — stay back at least 500 yards, but keep the whale in sight. Then wait for the trained responders to handle the situation.

For an update on Polaris, or to learn more about the Center for Coastal Studies, go online to www.coastalstudies.org.

Katie Mosher, Managing Editor

IN THIS ISSUE

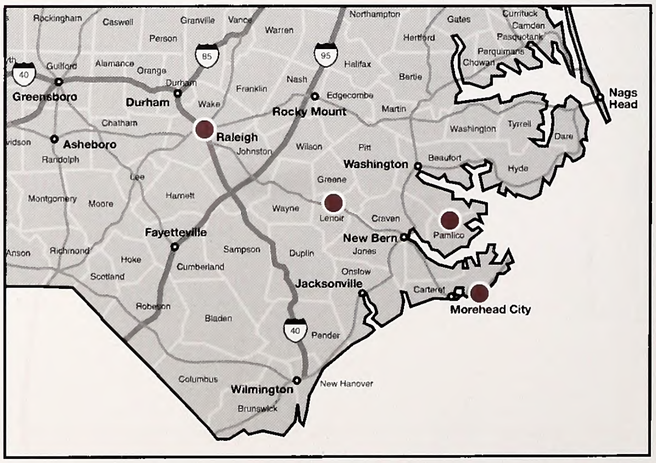
Contributing Writers:

Ann Green ▫ Cynthia Henderson ▫ Robin Sutton
Katie Mosher ▫ Pam Smith

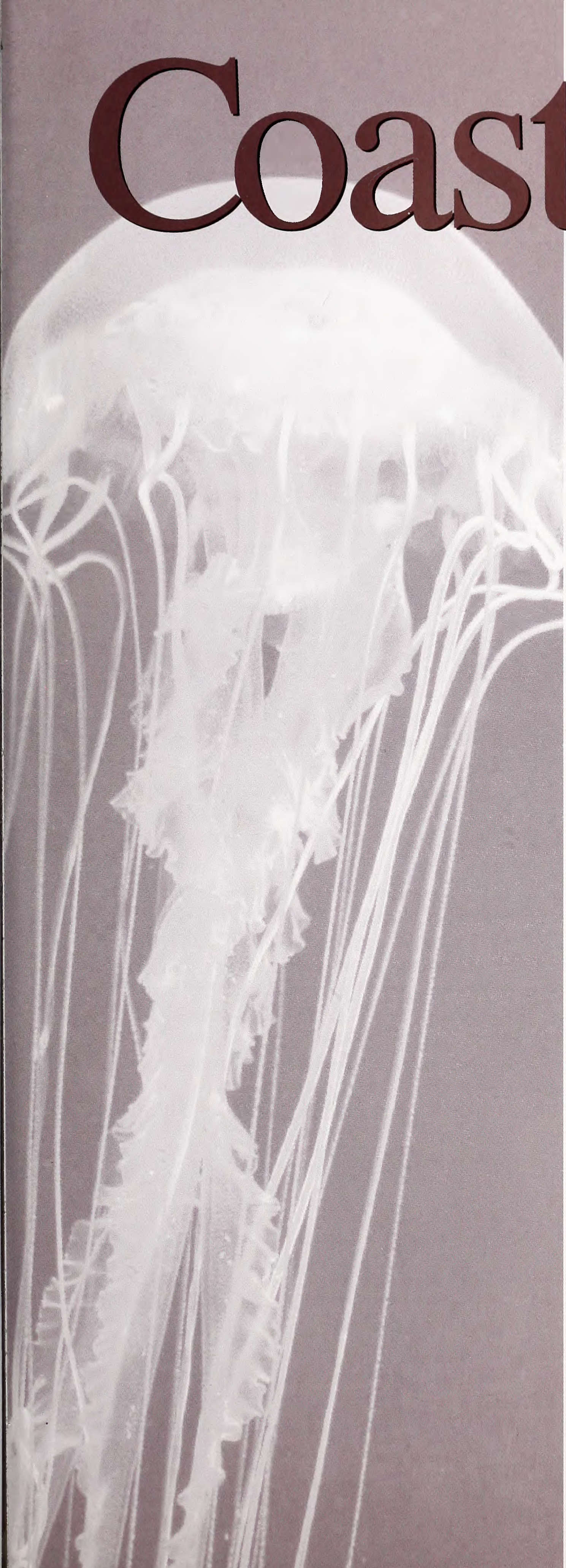
Contributing Photographers:

Barbara Doll ▫ Donna Johnson ▫ Herman Lankford
David Nash ▫ Scott D. Taylor ▫ Sheri Thomas

North Carolina's diverse coast offers countless interesting subjects. The large dots on the locator map indicate story settings in this issue — including Core Banks in Carteret County, as well as Kinston and Raleigh.



Coastwatch



FEATURES

COASTAL TIDINGS 2

GONE FISHING:
TRADITIONS THRIVE AT CORE BANKS CAMPS
For years, anglers have been flocking to the Alger G. Willis Fishing Camps along the southern part of Cape Lookout National Seashore. Ann Green shares the camps' colorful history and offers readers an inside look at the rustic cabins. 6

RESTORING INLAND STREAMS,
RENEWING COASTAL WATERS
Finding ways to restore degraded inland streams is critical to protecting the health of aquatic ecosystems in the state's estuarine fish nurseries. Sea Grant's Barbara Doll takes on the challenge with Rocky Branch, an inland stream in the nutrient-sensitive Neuse River Basin. 11

NORTH CAROLINA SEAFOOD PROCESSORS GO GLOBAL
Through the N.C. Fishery Resource Grant Program, companies are developing new value-added seafood products, including the Buffalo Catfish Nugget. Cynthia Henderson takes readers to a seafood plant that is diversifying its products. 16

PEOPLE & PLACES:
***CSS Neuse*: An Ill-Fated Ironclad**
In spite of her less than glorious service in the Confederate Navy, the *CSS Neuse* tells an important piece of Civil War history. Visit her relic hull — pulled from the muddy bottom of the Neuse River in the 1960s — in Kinston. 20

NATURALIST'S NOTEBOOK:
Jellyfish: A Stinging Sensation
Although an encounter with a stinging jellyfish is one that most swimmers won't forget, many jellyfish are actually harmless. Robin Sutton updates beachgoers on which jellyfish to avoid and treatment for stings. 23

SEA SCIENCE:
Quality Key to International Seafood Standards
In Europe, the Quality Index Method provides producers, buyers, sellers and retailers with a reliable way to measure the freshness of raw fish. A Danish graduate student shares the quality standards with North Carolina Sea Grant researchers in Morehead City. 26

Coastwatch

Managing Editor
Katie Mosher

Senior Editors
Ann Green
Pam Smith

Contributing Editor
Cynthia Henderson

Designer
L. Noble

Circulation Manager
Sandra Harris

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 15-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X)
is published six times a year by the
North Carolina Sea Grant College Program,
North Carolina State University, Box 8605,
Raleigh, North Carolina 27695-8605.
Telephone: 919/515-2454. Fax: 919/515-7095.
Subscriptions are $15.
E-mail: katie_mosher@ncsu.edu
World Wide Web address:
http://www.ncsu.edu/seagrant
Periodical Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to
Coastwatch, North Carolina Sea Grant,
North Carolina State University, Box 8605,
Raleigh, NC 27695-8605.

Sea Grant
North Carolina

Front cover photo of Core Banks by Scott D. Taylor.
Table of contents photo courtesy of the National Aquarium in Baltimore.
Printed on recycled paper. ♻

COASTAL TIDINGS

Scott D. Taylor

Big Sweep Set for September

Volunteers from the coast to the mountains will roll up their sleeves on Saturday, Sept. 21, to take part in North Carolina Big Sweep, the annual statewide waterways cleanup.

Founded as Beach Sweep in 1987 by North Carolina Sea Grant's Lundie Spence, the event has grown from its original 1,000 volunteers along ocean beaches to being a statewide waterway cleanup. To date, more than 163,000 volunteers have collected more than 7.6 million pounds of trash. The program now has reached across the U.S. and to international shores.

Last year, more than 17,000 North Carolina citizens collected 580,626 pounds of trash in the one-day effort, breaking the all-time collection and volunteer participation record for the state. The Big Sweep team covered more than 1,400 miles of stream, river, sound and ocean shores.

North Carolina Big Sweep Inc. also sponsors a pilot Adopt-A-Beach program and provides a variety of educational resources to encourage environmental stewardship.

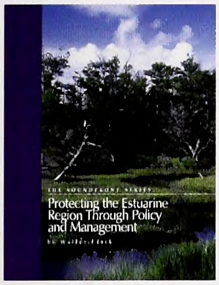
To join the volunteer team on Sept. 21, or to find out more about North Carolina Big Sweep, go online at *www.ncbigsweep.org*, call 919/404-1698 or e-mail *ncbigsweep@mindspring.com.*

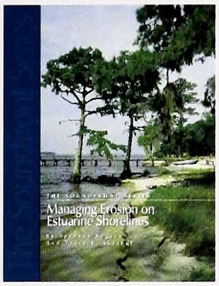
– P.S.

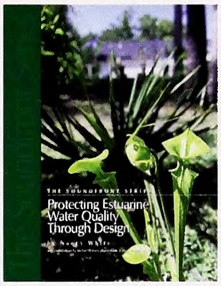
In the Next Issue of *Coastwatch*

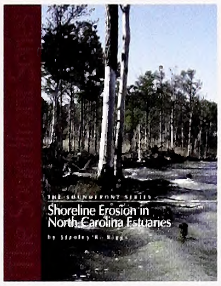
Watermark, one of the oldest craft cooperatives in the country, reflects coastal culture and traditions – from baskets to bird houses. Pam Smith visits the Camden shop to share a holiday wish list.

Through a Sea Grant-funded program, teachers and students are developing new resources for earth science teachers. Ann Green joins teachers, university faculty and students as they look at barrier island processes at Jockey's Ridge. She also offers readers a holiday menu with tasty seafood dishes.


THE SOUNDFRONT SERIES
Protecting the Estuarine Region Through Policy and Management
by Walter Clark







Soundfront Series Debuts

North Carolina Sea Grant has introduced the first four documents of *The Soundfront Series*. The guidebooks, designed to assist property owners and community planners and managers, focus on sustainable growth along estuarine shorelines in North Carolina.

The long-term environmental health of the land, water and other natural resources requires awareness, understanding and implementation of sustainable design and management options.

North Carolina Sea Grant teamed with the N.C. Division of Coastal Management and the North Carolina State University College of Design to develop the informational guidebooks. Funding for the publications came from the National Oceanic and Atmospheric Administration.

The series includes:

- *Shoreline Erosion in North Carolina Estuaries,* by Stanley R. Riggs of East Carolina University, UNC-SG-01-11, $7;
- *Managing Erosion on Estuarine Shorelines,* by Tracy E. Skrabal of the N.C. Coastal Federation and Spencer Rogers of North Carolina Sea Grant, UNC-SG-01-12, $4;
- *Protecting Estuarine Water Quality Through Design,* by Nancy White of the NC State College of Design, UNC-SG-01-13, $7; and
- *Protecting the Estuarine Region Through Policy and Management,* by Walter Clark of North Carolina Sea Grant, UNC-SG-01-14, $4.

The guidebooks may be ordered individually at indicated prices, or as a set for $20. All prices include shipping. Later this fall, they will be available online at *www.ncsu.edu/seagrant.*

To order the books, send the request with a check to North Carolina Sea Grant, NCSU Box 8605, Raleigh, NC 27695-8605. — P.S.

Celebrate Down East Heritage

Scott D. Taylor

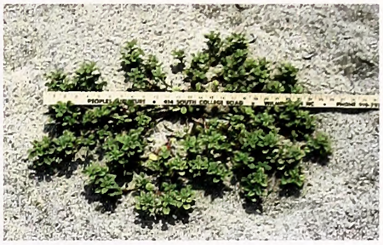
Want to learn more about Down East traditions — from storytelling to boat building?

Attend the Core Sound Waterfowl Weekend Dec. 6-8 at the new Core Sound Waterfowl Museum on Harkers Island. The festival will feature waterfowl carvers, artists, copper sculptors, model boat builders, as well as traditional music, duck-blind building and hiking.

The festival kicks off with the Harkers Island outdoor decorating contest.

For more information, call 252/728-1500 or visit the Web: *www.coresound.com/weekend.htm.*

— A.G.


David Nash

Rare Herb Rebounds

The seabeach amaranth, a threatened shore herb, is rebounding on the newly nourished Indian Beach. A sea turtle monitor made the find in July while patrolling Indian Beach for turtle nests.

Many in the scientific community feared that beach nourishment would have negative impacts on native species, such as amaranth. "It has been found in multiple locations along the renourished beach," says David Nash.

Nash, Cooperative Extension commercial horticulture and coastal management specialist for Brunswick and New Hanover counties, says he has seen amaranth making a comeback on other nourished beaches in North Carolina.

"We are seeing a lot of robust plants," he says. "Apparently the newly widened beaches provide the protection the rare herb requires."

Eroding beaches discourage the growth of the seabeach amaranth. Once common from South Carolina to Massachusetts, its range has shrunk along with its habitat. Now, it is found only sparsely in North Carolina, Virginia and Maryland.

Nash has applied for a special permit to enable him to collect seed from the amaranth for greenhouse propagation. The plant plays an important role in coastal ecology, acting as a sandtrap. As the plant decays, it adds valuable nutrients to the sand. The plant is usually found on overwash flats, lower foredunes and upper strands of noneroding beaches.

— P.S.

Photo courtesy of the U.S. Fish & Wildlife Service

WOW Moves to October

Want to explore a maritime forest's swamps and dunes for warblers, woodpeckers and other birds? How about taking a boating safari through a salt marsh or a night hike on Jockey's Ridge sand dunes?

All these natural history trips are part of the 6th Annual Wings Over Water Festival that will be held Oct. 15-20 on the Outer Banks. Many birding and paddling trips also are being offered.

The festival, which celebrates wildlife and wildlands in eastern North Carolina, also features several speakers, including David Jones, director of the N.C. Zoological Park. In addition, educator workshops offer credits toward teacher certificate renewal.

To preregister, visit the Web at *www. northeast-nc.com/wings*. – A.G.

Cheerful Twitters

Every October, they come by the thousands. With bright, metallic greenish-blue colors on their backs and pure white on their throats, tree swallows *(pictured above)* are easy to spot – and a delight to birdwatchers along the North Carolina coast.

Eighty percent of the tree swallows' diet is insects, says Dennis Stewart, refuge biologist for the U.S. Fish & Wildlife Service. But, in the colder months they can be happy eating seeds and berries. They are one of only a few birds that can digest the waxy outer coating of fruit-like bayberries. Another of their fall favorites is wax myrtle.

According to Stewart, tree swallows typically have harsh, yet cheerful twitters. Their note is a repeated *siyip* – and they're known to be especially noisy when they feed while flying.

Though they migrate in flocks, tree swallows nest in isolated pairs, choosing to make their homes about seven feet away from their neighbors. The females build their nests out of grasses, then line them with white feathers.

Nests may be found in open areas near the water, in natural crevices, such as small cavities left by woodpeckers, and in wooden birdhouses. – R.S.

NOAA Honors Power Squadrons

The National Oceanic and Atmospheric Administration (NOAA) has recognized the U.S. Power Squadrons for contributions to the Cooperative Charting Program.

Since 1963, Power Squadron volunteers around the country have partnered with NOAA to help update more than 1,000 nautical charts.

Each year, members submit about 60 percent of the reports that NOAA receives on geodetic control marks — disks made of brass, bronze or aluminum with 3- to 4-inch diameters. They have been placed strategically around the country to provide starting points for surveying and mapping. In 1807 there were close to one million marks, but many have been destroyed by development or erosion and other natural causes. The data on their locations are constantly changing as new marks are instituted.

Power Squadron members look up these marks on NOAA's online database and then go to the field to find them. Upon locating the marks, they provide NOAA with directions to the marks, as well as information on each mark's latitude and longitude.

Power Squadrons also supply NOAA with reports on tide and current predictions.

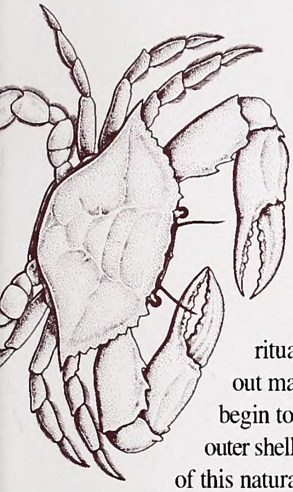
"We rely on the Power Squadrons to be our eyes and ears on the water," says Captain Dave McFarland, director of the Coast Survey.

Information these volunteers provide to the government is vital to the economy. Two-thirds of commercial goods come through the port system, and 78 million recreational boaters pump billions of dollars into the economy.

Power Squadron volunteers also work hand-in-hand with the government on navigational safety. Promoting safe boating through education was the mission of the small group that founded the organization in Boston in 1914. Today, more than 6,000 members, organized in 450 squadrons throughout the country, remain dedicated to safety on the water. They teach safe boating classes to the public and offer classes in seamanship and navigation.

For more information, call the U.S. Power Squadrons' national headquarters in Raleigh, 888/367-8777, or go online at *www.usps.org/*. – R.S.

Crab Sex Appeal



It's only natural to wonder what attracts female blue crabs to males — if you're a scientist or crabber.

As part of the mating ritual, female blue crabs seek out males when the females begin to molt, or lose their hard outer shells. Crabbers take advantage of this natural attraction by using male crabs as bait for the females, which are about to become valuable soft-shell crabs.

One of 14 Blue Crab Research Program grant recipients in 2002, crabber Dell Newman of Swan Quarter is teaming with Dan Rittschof of Duke Marine Laboratory in a project called "Pheromones from Male Crabs: Basic Properties and Bait Potential." The two hope to identify the male pheromone that attracts females for potential use in artificial bait in the soft-shell crab industry.

And how about crabs as bait for high school students? In a study with an educational twist, David Eggleston of North Carolina State University will work with coastal high schools to lure students into the arena of scientific inquiry. Students from Cape Hatteras, Manteo and Mattamuskeet high schools will assist researchers in studying larval recruitment of blue crabs, comparing data from previous years to determine the success of the fishery.

The Blue Crab Research Program is funded by the N.C. General Assembly and administered by North Carolina Sea Grant in order to address problems confronting the state's most lucrative fishery. Hard crab landings in North Carolina have fluctuated considerably in recent years.

The program encourages collaborations between scientists and the fishing community.

For information about the 2003 N.C. Blue Crab Research Program, go online to *www.ncsu.edu/seagrant* and follow research links, or call North Carolina Sea Grant at 919/515-2454. Or, e-mail Marc Turano at *marc_turano@ncsu.edu.* — C.H.

Nominees Sought for Conservation Awards

Do you know of a person who has worked tirelessly to protect a local creek, or maybe a group of citizens making a positive impact on environmental issues in a community?

Perhaps you know a scientist who goes beyond the call of duty in studying the natural denizens of the coast — and in alerting the public about issues relating to their conservation.

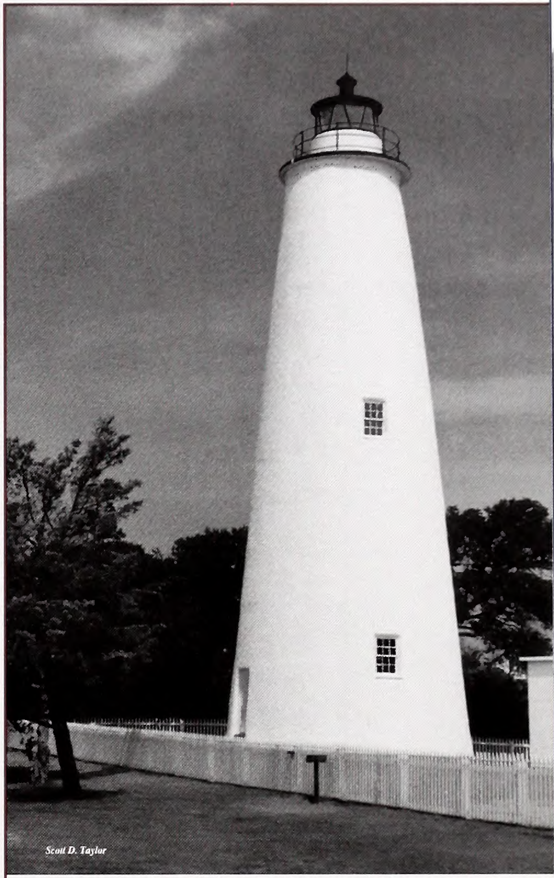
Each year the N.C. Wildlife Federation presents the prestigious Governor's Conservation Achievement Awards Program — the highest conservation honors given in the state — to acknowledge individuals, governmental bodies, associations and others who exhibit an unwavering commitment to conservation in North Carolina.

By recognizing, publicizing and honoring these conservation leaders — young and old, professional and volunteer — the Wildlife Federation hopes to inspire all North Carolinians to take a more active role in protecting natural resources.

Nominations are sought in 14 categories — from Conservationist of the Year to Environmental Educator of the Year, including categories for youth, conservation organizations, businesses and municipalities. Special categories honor contributions to sportsmanship and conservation of forests, aquatic ecosystems, water quality and air quality.

The Governor's Conservation Achievement Awards Program has a half-century legacy of discovering, honoring and publicizing the state's conservation heroes — and it's all done through nominations from the public.

Nominations are due Dec. 13, 2002. A complete list of categories and downloadable forms are available from *www.ncwf.org*. For more information, contact the N.C. Wildlife Federation at 800/264-6293.



Scott D. Taylor

Dr. Beach Picks Ocracoke

Ocracoke Island was among "America's Best Beaches for 2002" named by Stephen P. Leatherman, director of the Laboratory for Coastal Research at Florida International University in Miami.

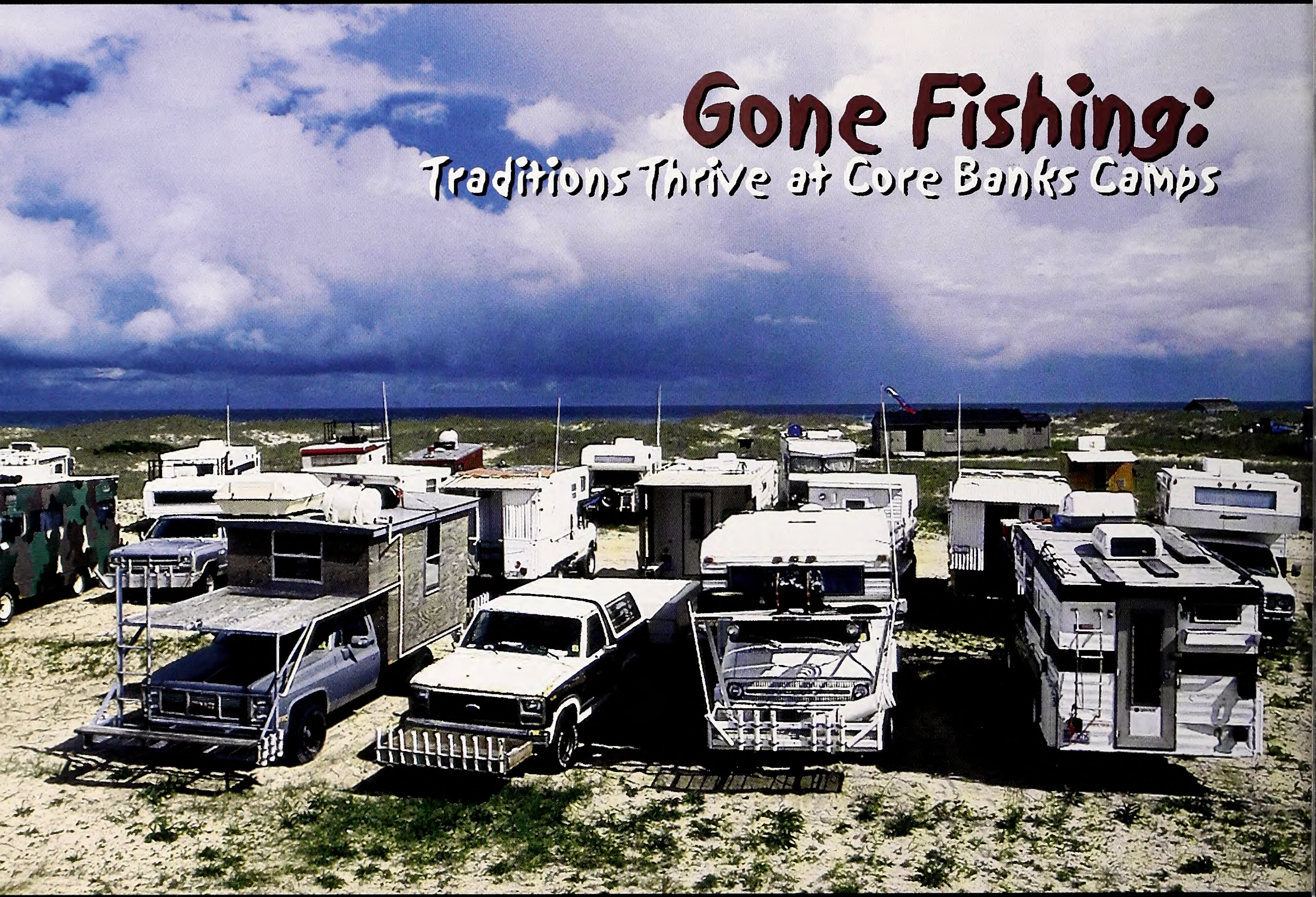
Leatherman, also known as "Dr. Beach," annually ranks the top beaches in the country. The expert visited some 650 major public recreation beaches before making his "top 10" selection.

His 50 criteria for judging include beach width, condition, sand softness and color, size of breaking waves, water color, currents, cleanliness and the presence of shorebirds.

Ocracoke was in good company. The "best beach" list included four in Hawaii, four in Florida and one in New York. — P.S.

Gone Fishing:

Traditions Thrive at Core Banks Camps



By Ann Green • Photos by Scott D. Taylor

The Alger G. Willis Fishing Camps at Core Banks are within walking distance of the Atlantic Ocean.

As a bluish-black storm cloud moves over the sky, Capt. Ronnie Willis steers a small white ferry toward "God's country."

"You can't find any prettier place than Core Banks," says Willis, co-owner of Alger G.Willis Fishing Camps. "The ocean is the best part."

Willis is the third generation of his family to take fishers and nature lovers on a ferry from Davis across Core Sound to the pristine and remote beaches along the southern shore of Core Banks or Cape Lookout National Seashore.

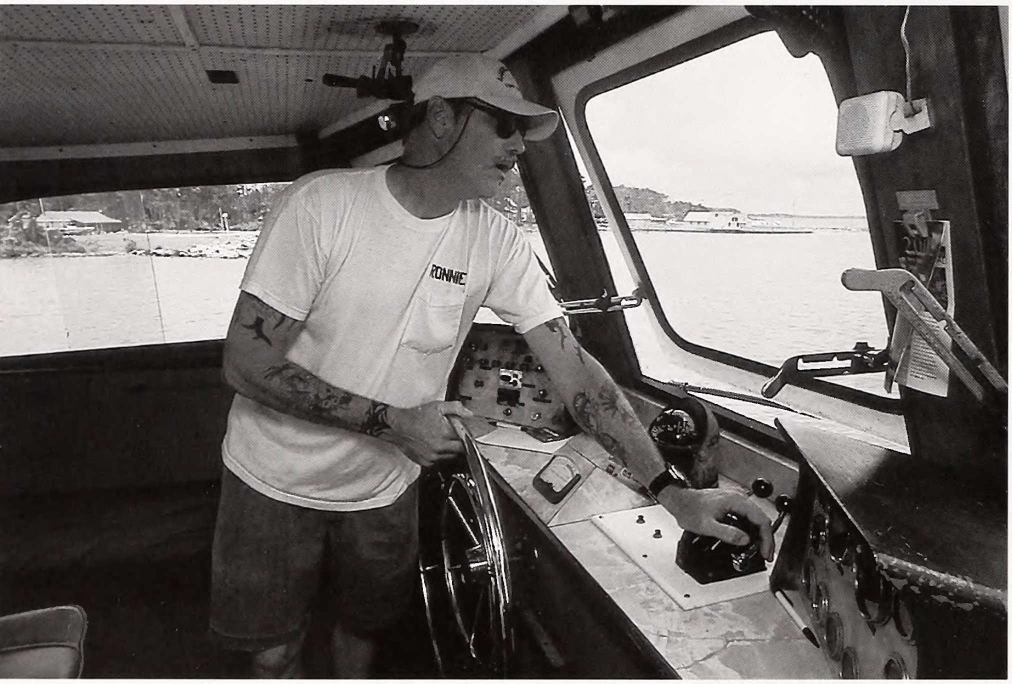
Protected and maintained by the National Park Service, Core Banks is uninhabited except for "people who mostly come to the Banks to fish and get away from the rat race of the city," Willis explains.

As soon as the ferry reaches the dock, visitors begin unloading their trucks and sport utility vehicles. First, a red 4x4, loaded with more than a dozen coolers on the back and fishing rods across the front, heads down the plank. An old white pickup truck and red and black sport utility vehicles follow.

The vehicles head down a sandy road toward the beaches of the southern end of Core Banks. They will find almost complete silence except for the crashing of waves and the zing of fishing rods.

A few yards away from the beach, a bobwhite whistles above a rustic wooden cabin that is part of the Willis fish camps, the only accommodations on the island's southern end. On northern Core Banks or Portsmouth Island, people also can stay at Morris Marine Kabin Kamps.

Continued



TOP: Vehicles on the Willis ferry from Davis to Core Banks are loaded with fishing gear and ice chests. BOTTOM: Capt. Ronnie Willis is the third generation of his family to transport visitors from Davis across Core Sound to the Cape Lookout National Seashore.

Over the years, surf fishers — including Babe Ruth and other famous folks — have flocked to Core Banks.

"It is the best place to fish," says Vee Wolff of Bethania in Forsyth County. "My husband would come here all the time if he could. It is pristine and heaven on earth if you like nature, clear water and fishing."

Toward the end of the barrier island, all 25 cabins and the caretakers' quarters are scattered within a mile along an unpaved road between the ocean and marsh.

The island is one of three comprising the Cape Lookout seashore that stretches more than 56 miles — from Beaufort Inlet to Ocracoke Inlet, including Shackleford Banks and North and South Core Banks. Core Banks — a single island from the late 1800s until a 1933 hurricane cut an inlet through it — is divided at New Drum Inlet into South Core Banks and North Core Banks.

"South Core Banks is a washover island," says Lundie Spence, North Carolina Sea Grant education specialist. "It is so narrow that there are no forests. There are lots of sea oats on low dunes and shrub thickets."

Rustic Cabins

Inside, the cabins are comfortable but sparsely furnished. Cabin #5 has a screened porch ideal for relaxing and hanging wet suits. The combined living room/kitchen area has unfinished walls along with a gas stove, sink, cabinets, a white plastic table, chairs and a bunk bed.

The bathroom has a shower. Two bedrooms each have bunk beds. At night, you can pull up the windows in the bedrooms and hear the roar of the ocean waves.

"My family was from Portsmouth Island," says Eric Roberts of Greenville, who is staying in a two-bedroom cabin. "I like the solitude away from everybody. I have been coming at least once a year for seven or eight years. I fish and sit around. There are no worries of home and no electricity. It is the perfect getaway."

Nighttime offers an opportunity to view wildlife. One night, a couple of young raccoons sneak around the corner of the cabin and stare with their big, glowing eyes.

Because of its isolation, the shore is also a great place for stargazing. On a clear night, you can see the blinking lights of the Cape Lookout Lighthouse located several miles down the beach.

"The beach is great," says Spence. "There are no lights. Every star is so much brighter. Even common constellations are hard to find among all the visible stars."

Fish Camps' Heritage

Built in the 1950s by different individuals, the rustic fish cabins have a rich history.

The cabins were basically "stud shacks with weatherboard or tar paper siding," according to B.K. Barringer of Mooresville, who began staying at the cabins in the 1960s. Garages or barns protected old cars from the harsh weather and scavengers looking for parts.

On the end of the island where the old north dock is, Carlie Willis ran a fish camp. Next to him, Sterling Dixon ran another operation. Further south, there were two camps operated by Marvin Murphy and Ronnie Willis' grandfather, Alger Willis.

Both Carlie and Alger carried fishers and their gear to the island on fishing boats converted to ferries. Many of the boats did not have a reverse gear. When a ferry got to the dock, the captain made a turnaround, looping a line around a piling and swinging the ferry around to back up to the dock for loading and unloading, according to Barringer.

As soon as they arrived, Barringer and his fishing buddies would lay their fishing poles, "often large Calcutta bamboo poles," flat across the top of the fishing buggies so they could drive under the Coast Guard telegraph lines that ran across the center of the island, he says.

When they got to the cabin in those early days, they would unlock their shacks, start their old beach buggies, and check to see if the electricity was hooked up and if water was in the elevated tank.

"You couldn't drink the water," says Barringer, president of the Davis Island Fishing Foundation (DIFF), an organization that works with the Park Service to preserve South Core Banks. "There was so much harmful bacteria in the water that your fingernails would puff up after being there a couple of days. Only the hardy went down there."

Barringer says that he usually found the best fishing holes when they had to stop to fix a flat tire or overheated radiator, or when they got stuck in the sand. "One time, I changed eight flat tires before coming home. You never ventured too far on the island."

Because of the remoteness of the island, some fishers stayed at Alger's big white home on the waterfront in Davis before making the trip.

"In the 1950s and 1960s, my grandma and grandpa operated a lodge in their house," says Annette Mitchum, now co-owner of the Willis camps. "They used to sleep customers and cook breakfast."

As a child, Mitchum often played on the Banks while visiting her grandparents. "Back then, you only had two-wheel drive vehicles," she says. "A lot of people brought their station wagons and shovels and boards in case they got stuck. You were pretty much on your own. There weren't many people over there."

In 1976, Core Banks was transferred from the state of North Carolina to the National Park Service, establishing Cape Lookout National Seashore.

Because many of the cabins were in such bad shape, the Park Service burned more than 300 cabins on Core Banks and at Portsmouth, according to Mike McGee, seashore facilities manager. "None of these were historic," he adds.

Some fishers who were angry with park officials for taking over the island also burned their cabins.

At that time, Alger Willis began managing all the remaining cabins through a Park Service contract.

Cabin Facelifts

Over the years, the Park Service has made a lot of improvements to the cabins. In the 1980s, a new well was put in. The water began going through a chlorination process to make it potable, according to Ronnie Willis.

Now, all cabins have hot water, propane gas stoves and showers. Most also have hookups for electric generators.

With modernization, more fishers began bringing their families to the cabins.

"Until the mid-1980s, it was mostly diehard male fishers," says Mitchum. "You didn't see many women come until they got showers in the mid-80s."

Gradually, the cabins also have gotten facelifts on the outside and inside. Some fishing clubs, including DIFF and the Core Banks Surf Fishing Club, organize work weeks to spruce up the cabins.

Now, the Park Service is rehabilitating three to four cabins a year, according to McGee.

"We are trying to update the concessions so they can be used by fishermen and families," says Bob Vogel, the park superintendent. "We are not upgrading the facilities to make it a resort. The camps will remain remote and primitive."

Fishers flock to the fish camps in the fall when red drum and bluefish are running strong.

By the end of January, all cabins are booked for October, says Willis. "In the fall, we run three boats, five times a day, seven days a week."

Beach Cleanup

Since the Park Service took over Core Banks, they also have cleaned up the piles of junk cars left on the beach.

"As late as the 1960s, people commonly bought a car for $50 or $100, usually with bald, tubed tires, and they took the car over by ferry, let the air out of the tires until the walls sagged, and drove on the beach, according to David Stick's *Outer Banks Reader*. "If the car died, the owner would leave it, figuring he had gotten his money's worth.

"The Park Service estimated in the mid-1970s that some 2,500 junk vehicles were on the beach, forming dunes of their own. Government helicopters lowered huge magnets onto the sand to airlift the skeletons."

Near the ferry landing was a large junkpile where the RVs park today.

Volunteer groups, including the DIFF and Core Banks clubs, helped pick up metal scraps — from pieces of cars to hot water heaters and stoves.

"It took 10 or 12 dump trucks to get rid

Continued

Core Banks is a favorite spot for fishers during the fall of the year.

of the trash," says Tom Monaco, president of the Core Banks Surf Fishing Club and head of the Horticultural Department at North Carolina State University.

Today, you see only a scattering of engines, hubcaps and other rusted car parts on part of the beach.

"There is an old saying: That an old car is under every sand dune," says Barringer. "If you go out today at low tide, you can see dozens of cars in one place."

Recreational Vehicles

During the 1990s, more people began bringing their recreational vehicles to the island.

At the southern end, near the Willis ferry dock, the parking lot is packed with a variety of recreational vehicles with distinct names — from "Junkyard Dog" and "Destiny's Child" to "Free Spirit Club" and "Drumwagon.com."

When Barringer brought his white 1976 Winnebago to the island, he dubbed it "Nirvana" for the "utopia and bliss" on the island. "I spent 40 days down here last year," he says. "I park on the beach. Sometimes I never see anyone for three or four days."

The RVs come in a variety of colors and styles. An old school bus called the "Byrd's Nest" is painted white and blue. Another vehicle is painted like the Cape Lookout Lighthouse with black and white diamonds. It has a dartboard on one side and porch on the back. Farther back, a gray truck supports a homemade plywood trailer on its top.

Flags adorn many of them — from American and Confederate flags to the red and white colors of NC State and orange and white of the University of Tennessee.

The insides of the campers also reflect the personality of the owner.

Jay Honeycutt's "Jay Bird," which is fully equipped with a kitchen, is decorated with maroon curtains and a fish clock. You can climb a ladder to a second floor that was made from a truck bed and has a queen-size bed.

"I have been coming here for 12 years," says Honeycutt of Concord. "It was my dream since I was 16 years old to have a vehicle and bring it on the beach. I started coming in a pickup truck. Then I got this RV and built the second floor on top."

Honeycutt brings his wife, children and grandchildren. They park on the beach.

"We used to go to Hatteras," he says. "I'd just as soon go to Myrtle Beach as Hatteras. I use (the RV) to get away from the hustle and bustle of crowds."

Even on Core Banks, the number of recreational vehicles has increased such that the parking lot near the Willis ferry dock has been enlarged in the last three to four years, according to Vogel.

"At some point, we will need a plan that allows the use of vehicles, but looks also at the vehicles' impact on cultural and natural resources," he says.

Also, more people are visiting the southern end of the national seashore. The number of ferry passengers carried by Alger Willis Fishing Camps jumped from 7,893 in 1992 to 10,934 in 2001, according to the Park Service.

Overall, the number of visitors to all three islands in the national seashore has escalated from 340,081 in 1992 to 571,949 in 2001.

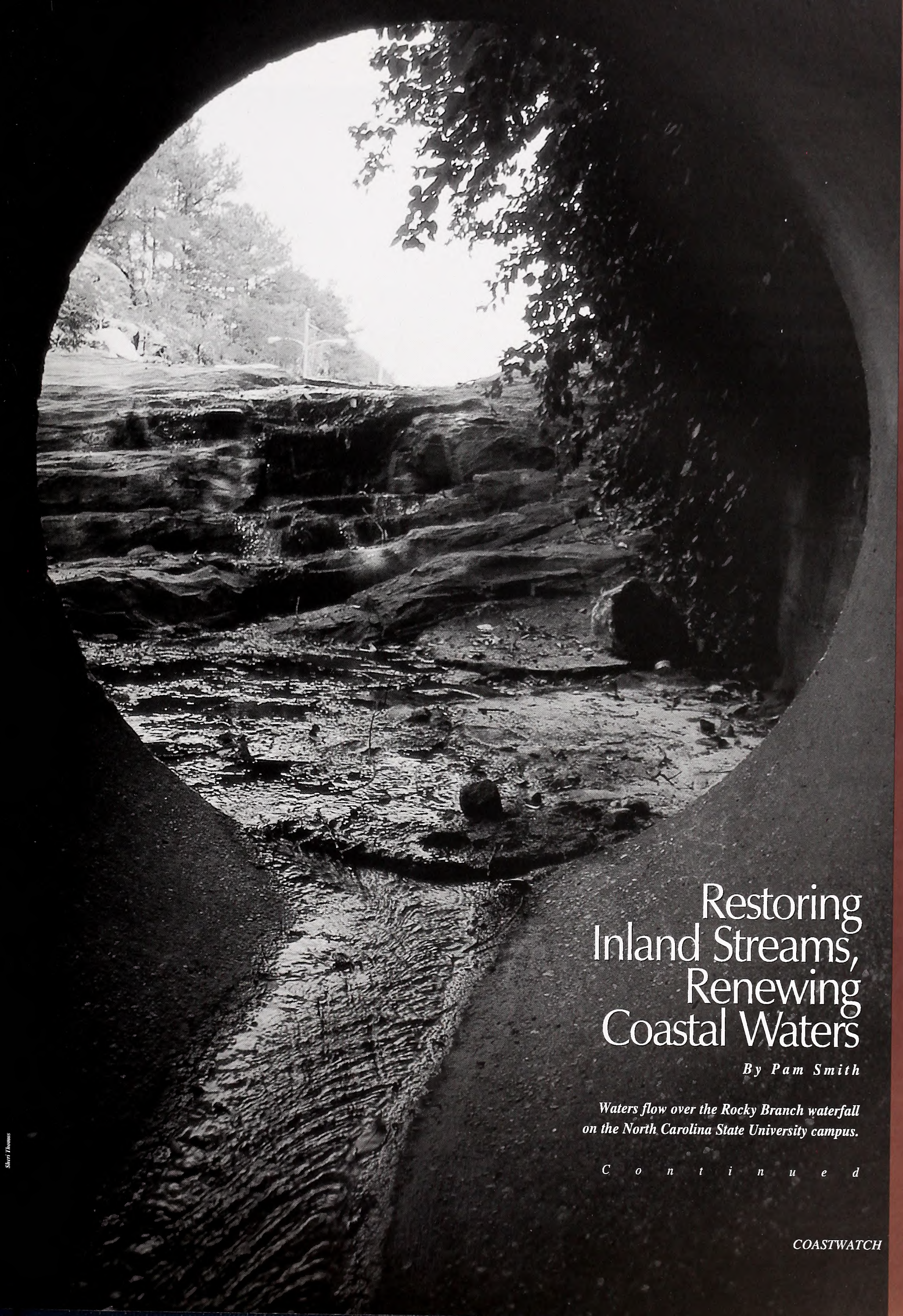
Because of the rise in visitors and conflicting visitor uses, the Park Service will begin developing a commercial services plan that identifies services, activities and conditions that are and are not appropriate within the park's boundaries. Examples include the availability of rental cabins, ferry services and four-wheel drive tour services.

That plan will take about a year to complete, according to Vogel. Over the next year, the Park Service also hopes to begin developing a new general management plan, which could include anything from development to management of the wild horses.

"All of our planning efforts are done to provide enjoyment for today's visitors while still preserving the park's unique resources," he adds.

Where else in North Carolina and the United States, do you have this "serenity, natural beauty and lack of development?" ◘

Cape Lookout National Seashore is accessible only by private ferry or a private boat. For ferry information, visit the park's Web site: www.nps.gov/calo. *To book a ferry or cabin at Alger G. Willis Fishing Camps, call 252/729-2791. To get a ferry or cabin at Portsmouth Island, call Morris Marina Kabin Kamps & Ferry Service at 252/225-4261. Core Banks Fishing reports also are available online at* www.drumwagon.com.



Sheri Thomas

Restoring Inland Streams, Renewing Coastal Waters

By Pam Smith

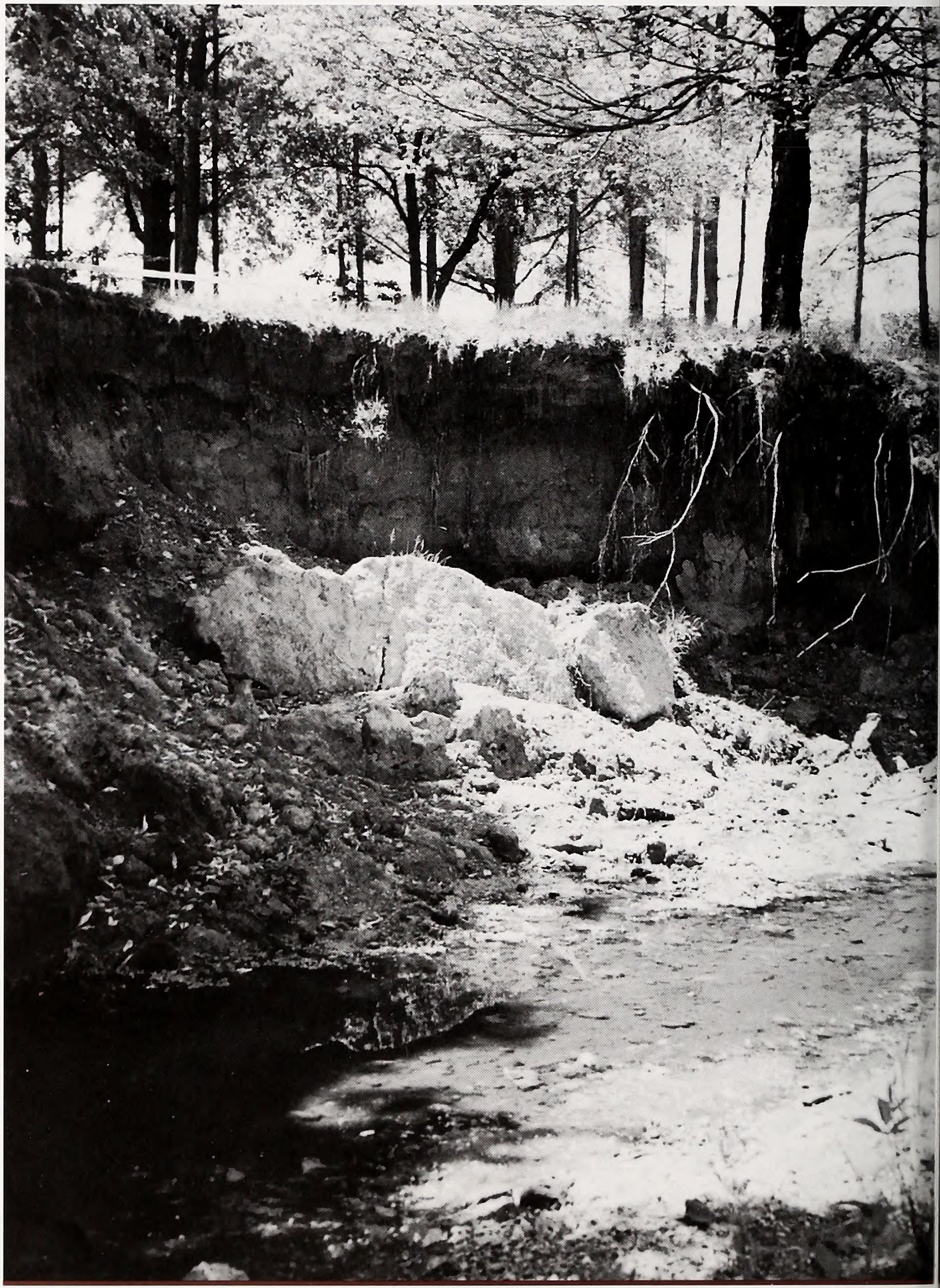
Waters flow over the Rocky Branch waterfall on the North Carolina State University campus.

Continued

There once was a freshwater stream
that bubbled from beneath a forest floor,
meandered through towering oaks,
and glided across smooth rocks
to join forces with a lively, deep creek.
The merged waters poured into a
swift-flowing river, coursing toward the coastal
plain to salty sounds that seeped through
narrow inlets into the Atlantic Ocean.

The stream and its banks were teeming with life
— fish and wildlife, flowers and trees.
It was a delight to local inhabitants,
who dubbed it Rocky Branch.

Time passed. Deforestation and agriculture
began to carve changes into the landscape.
A city and a major university slowly crowded
out the rural setting. After more than a century,
the once pristine waters of Rocky Branch
were forced through channels and squeezed
into culverts and between buildings.
In some places, the stream disappeared
beneath roads and parking lots.



ABOVE: Before — The severely eroded banks of Rocky Branch presented challenging hurdles for the team. Along with a century of man-made land disturbances, the stream took a major hit from Hurricane Fran in 1996. RIGHT: After — Barbara Doll, second from right, stands in the restored floodplain along the same stretch of Rocky Branch shown on previous page. The winter wheat holds the reshaped banks in place in the new "outdoor classroom."

Urbanization — and runoff from "hardened" landscape — took a heavy toll on the stream. In 1978, the N.C. Division of Water Quality (DWQ) designated Rocky Branch "the most polluted urban stream in North Carolina" — a dubious distinction with serious environmental implications. Rocky Branch flows more than a mile through the North Carolina State University campus to empty into Walnut Creek, a major tributary of the nutrient-sensitive Neuse River.

Sediment from land disturbance and runoff from roads, parking lots and buildings that accompany growth and development are major sources of pollution in much of the Neuse River Basin, where waters flow to the Pamlico Sound.

A starting point

In the late 1980s the N.C. Department of Environment and Natural Resources developed a water quality management plan that focuses on each of the state's 17 river basins. With DWQ guidance, comprehensive management plans are developed for each river basin every five years.

The basin approach to water quality planning follows natural ecological boundaries, explains Barbara Doll, North Carolina Sea Grant water quality specialist.

A river basin encompasses all the land that water flows through on its way to the river, and on to the estuaries and ocean, Doll says. Within each basin lie thousands of smaller watersheds, that is, areas of land draining into smaller streams or lakes. All water runs to the lowest point, carrying with it "calling cards" — sediment, bacteria, chemicals, nutrients and organic matter — that affect the health of aquatic ecosystems en route to and within the state's important estuarine fish nurseries.

So, finding ways to restore water quality stream-by-stream, watershed-by-watershed has far-reaching benefits. Inland stream restoration is a critical part of improving coastal water quality.

And, Rocky Branch was a starting point, says Doll.

Restoring urban streams such as Rocky Branch is important to protecting and restoring water quality in North Carolina, according to William Holman, director of the North Carolina Clean Water Management Trust Fund (CWMTF). But such efforts don't come cheap, he says.

When completed, the pricetag for the three-phase project will exceed $4 million. Along with a grant from CWMTF, funding sources include NC State; a Federal Environmental Protection Agency 319 grant from the N.C. Department of Environment and Natural Resources; Federal Emergency Management Agency; an N.C. Department of Transportation/federal transportation enhancement (TEA 21) grant; and NCDOT stream mitigation funds.

"We have partnered with North Carolina Sea Grant and other agencies because we respect Sea Grant's expertise. The Rocky Branch project is a great place to show the public how inland streams can be restored and lessen the impact on the Neuse River basin, and ultimately coastal water quality," Holman says.

A work in progress

Rocky Branch waters now flow along the recently completed Phase I of the Rocky Branch Stream Restoration and Greenway Project, Doll reports. That first 3,000-foot stretch represents years of hard work, perseverance, and support from Sea Grant, the university community, and state and federal agencies.

The phased project aims to improve water quality, enhance aquatic and wildlife habitats, and transform the stream into a vital part of campus and community life.

"The most compelling reason for this project is the environment," says Charles Leffler, NC State associate vice chancellor for facilities. "To put it simply, we have developed a comprehensive plan to improve the quality of water flowing downstream into the environmentally sensitive Neuse basin."

"Rocky Branch is expected to become a national model for urban stream revitalization," says Ronald G. Hodson, director of North Carolina Sea Grant. "This is consistent with the mission of both Sea Grant and a land grant university — leading the way for the nation in addressing major issues."

The restoration plan employs "natural channel design" to allow the stream to meander through a newly created floodplain. Native vegetation allows views of the creek while providing habitat, cover and food for wildlife. Natural materials, such as rootwads, willow branches and logs, were chosen for

Continued

streambank stabilization rather than riprap or other man-made materials.

To get the job done, Doll is collaborating with dozens of people from the university's Facilities Planning and Design Division, Office of the University Architect, College of Design and N.C. Stream Restoration Institute

No one is ready to rest on the laurels of a well-done Phase I. Phase II, set to begin next spring, will improve an additional 1,500 feet of the stream and environs. Phase III will restore another 1,600-foot stretch in 2004.

With each leg of restored stream goes a new leg of greenway to provide alternative transportation, recreational opportunities and greater access to the stream itself. At certain sites, the paths and stream will duck under busy street intersections for safer walking, biking or jogging within the campus. Ultimately, the Rocky Branch Greenway will join Raleigh's greenway system, which connects streams and parks throughout the city.

ABOVE: Barbara Doll points out one of the engineering challenges along the restored leg of Rocky Branch — redesigned road crossings to accommodate the raised stream bed and to drain floodwaters through floodplain pipes. RIGHT: In spite of drought-driven low water levels, the restored stream provides educational opportunities, as indicated by these water monitoring devices.

Later, interpretive signs will be installed to explain concepts of natural channel design and identify flora and fauna along the stream and greenway. College of Design students developed the Rocky Branch logo for the signs.

NC State design students have been part of the process from early on. In 1999, students in a landscape architecture design studio built a 30-foot model to illustrate the Rocky Branch stream/greenway design vision to prospective funding agencies. It also served as a conceptual model for the project.

Challenging hurdles

Doll, along with facilities project manager Jill Coleman, university landscape architect Sallie Ricks and construction manager Ted Devens seemed undaunted by the tremendous hurdles the project often presented.

It was important to minimize campus disruption and to maximize the funding resources. Once, Doll and Coleman spotted a rock spoil pile left over from a major construction project. It was exactly the kind of material needed for Rocky Branch. They struck a deal with the developer — and tons of rocks were theirs for the hauling.

The rocks would be used for a complex piece of engineering in the first phase — reworking the 16 culverts responsible for dumping storm water into Rocky Branch from a nearby urban thoroughfare and impervious surfaces throughout the watershed.

In any storm event, the force of the water would scour the streambed, destabilize the banks, and push huge amounts of sediment downstream. Over time, the eroded stream banks could not provide support for concrete culverts, which collapsed and fell into the stream bed. Hurricane Fran, in 1996, further eroded Rocky Branch, leaving behind more collapsed stormwater pipes, felled trees and exposed tree roots.

In spite of the cumulative harsh blows, there were signs that Rocky Branch was trying to repair itself. "It was fighting back, trying to meander; trying to re-establish its floodplain with vegetation, riffles and pools. Without help, it might have taken 20 to 25 years to heal itself. But in the meantime, huge volumes of sediment would have been dumped downstream," Doll says.

Phase I included replacing the storm water pipes. Also, new rock vanes would take the pressure off stream banks during storm events and reduce stream bank erosion.

Other engineering hurdles included relocating a 1,100-foot sewer line, and redesigning road crossings while maintaining steam, utilities and telecommunication services for university buildings.

Stormwater controls — such as bioretention areas and a constructed wetland — were constructed to filter and detain stormwater runoff from campus roads and parking lots. In addition, two rain gardens along a 2,800-foot segment of greenway divert stormwater runoff from the adjacent busy road — removing nutrients, sediment, bacteria and oil before draining into Rocky Branch.

Teachable moments

Education is an important aspect of the Rocky Branch restoration project, Doll points out. "Other than a few students and faculty, many on campus are not aware of the existence of Rocky Branch. Others refer to it as a 'ditch.' Long before we broke ground for the restoration, we began a campaign to encourage the use of Rocky Branch as an educational asset," she says. Student volunteers stenciled "Keep Clean" messages on more than 80 drains throughout the campus.

Through the leadership of Sam Mozley, professor of zoology, students in his laboratory class and the Lorax Environmental Club have monitored the aquatic inhabitants in the stream for nearly a decade. And, Tom Drake, professor of marine earth and atmospheric science, uses Rocky Branch for his geomorphology class exercises.

Doll frequently leads field walks for students in zoology, botany and wildlife studies. In addition, Rocky Branch is a demonstration site for the university's N.C. Stream Restoration Institute, an outreach program to professionals in public works, resource management and private consulting positions from across the state.

Andrew Burg, who heads up the Mecklenburg County Stormwater Services Department, is among the "students" who have witnessed the transformation of this outdoor laboratory.

Like Doll, Burg is involved in the formidable task of breathing new life into abused inland streams. He expects the nearly completed Little Sugar Creek Restoration and Greenway Project in Charlotte's Freedom Park to have a cumulative *positive* impact on the Catawba River, which flows across the South Carolina border en route to coastal waters. The project addresses stream and wetland restoration and stormwater management issues and is funded in-part by the North Carolina Wetland Restoration Program. It is the first in a series of projects in the Little Sugar watershed, including one funded by the CWMTF and one funded by the U.S. Army Corps of Engineers.

And, like Rocky Branch in Raleigh, Little Sugar Creek provides a "teachable moment" to convey the benefits of basinwide water quality management to public and elected officials in the greater Charlotte area.

"The important revelation about basinwide management is that we all are using the same water. Whatever sediment we put in upstream, whatever wastewater we put in upstream, whatever runoff we put in upstream all becomes someone else's water downstream," Burg says.

"If we can nip the problem at the source, we can prevent problems downstream. My job is to identify and fix past mistakes," he says. "It's also to try to educate the public and elected officials about protecting water quality. If we continue to just fix mistakes, we'll never get ahead of the water quality issue."

Enlightened citizens and officials must be involved in self-regulation, he says. For example, policies recently adopted by Mecklenburg County, Charlotte and many surrounding municipalities prohibit building in flood plains, require stream buffers from 25 to 100 feet, and require that developers leave at least 10 percent tree cover on building sites.

Prevention, Doll and Burg know, is much more cost-effective than finding ways and means to undo mistakes.

Meanwhile, Doll and Burg both continue to spread the water quality gospel and to plug away at breathing new life into failing urban streams.

"It's exciting to see the Rocky Branch recovery process beginning to take place," Doll says. "It may take some time to get back its full aesthetic value, but there will be no more banks falling in, no more sediment being carried away. Most importantly, the restoration of Rocky Branch is beginning to make a substantial difference to Walnut Creek and ultimately, the Neuse." ◘

EarthTech of Raleigh developed the working design plan for Phase I, and Tri State Consultants of Greensboro was selected as the contractor. Bids will be let for the next phase in 2003.

NORTH CAROLINA SEAFOOD PROCESSORS
GO GLOBAL

By Cynthia Henderson

ABOVE: Jimmy Johnson and Sarah Harris pause outside of Sea Safari in Belhaven.
RIGHT: Workers pack frozen value-added items, while Barry Nash confers with Sarah Harris.

Photos by Scott D. Taylor

In the crab-picking room at Sea Safari, Ltd. in Belhaven, women in waterproof boots, aprons and caps of many colors crowd around tables mounded high with cooked blue crabs. Beneath the audible chaos of many competing conversations is the visual rhythm of hands precisely disassembling crustaceans into handpicked, "gourmet" crabmeat.

The scene is its own contradiction. It is similar to crab-picking houses of the past, but the similarity merely accentuates the degree to which things have changed, and are changing. Local women who learned crab picking at their mothers' knees are rare. Conversations around the picking tables are in Spanish.

The picking house is only one in a maze of nondescript buildings collectively called Sea Safari on the Pungo River near the Pamlico Sound. The first clue that this is not an ordinary seafood processing plant is finding yourself eyeball-to-eyeball with a gigantic buffalo head mounted on the wall in a second-floor office area.

Sea Safari's owner, Topper Bateman, is an avid hunter, says Sarah Harris, the company's director of research and development. The buffalo was bagged by Bateman's wife on a hunting expedition.

While the buffalo on the wall has nothing to do with seafood, it may have, subliminally at least, influenced the name of one of Sea Safari's newest products — the Buffalo Catfish Nugget, a very lightly battered, deep-fried piece of succulent North Carolina aquacultured catfish.

The nugget is one of Harris' favorites from the company's line of "value-added" products and represents the expedition that Sea Safari is taking into the brave new world of global marketing.

Value-added foods are processed to be different in form, taste and texture from the principal raw ingredients. Barry Nash of North Carolina Sea Grant and the North Carolina State University Seafood Lab says that "value," in this context, means "using processing techniques, novel ingredients or packaging to enhance the health attributes, the sensory characteristics or the convenience of food."

Traditionally, Sea Safari's product list consisted of seafood products to be used as ingredients themselves, such as frozen crabmeat in a variety of forms — from jumbo lump to "cocktail fingers."

The value-added products began as a project funded by the North Carolina Fishery Resource Grant Program. Bateman applied for a grant from the program and put Harris in charge of developing the new items.

"The seafood industry has to diversify beyond commodities to compete in the global seafood market," Harris says, noting that many of the state's crab processing plants have gone out of business in recent years due, in part, to competition from imported crabmeat.

Product development is too costly and time-consuming for many small businesses. Yet, without this type of diversification, crab processing plants are likely to continue in a downward spiral.

The FRG project paired Harris with Nash to create a new line of crabmeat-based, value-added products.

FRG was custom-designed for this scenario. Funded by the N.C. General Assembly and administered by North Carolina Sea Grant, the program helps people in fishing and seafood industries to develop ideas for improving their businesses or the resources they depend upon.

Nash points to the success of Wanchese Fish Company in developing the "scallop medallion" in a previous FRG project that used enzymatic cold-binding to create large scallops from smaller, less profitable ones.

"The Sea Safari FRG was designed to show how textured vegetable proteins could add value to processed or cooked seafood," Nash explains. He and Harris proposed creating four new products: shrimp and crab appetizers, an inexpensive crab cake to target an economy market, and a higher priced crab cake to appeal to more affluent customers who shop online.

Results exceeded expectations.

Call it overachievement: The four products Harris and Nash set out to create ended up increasing the company's list of value-added seafoods from four to 22.

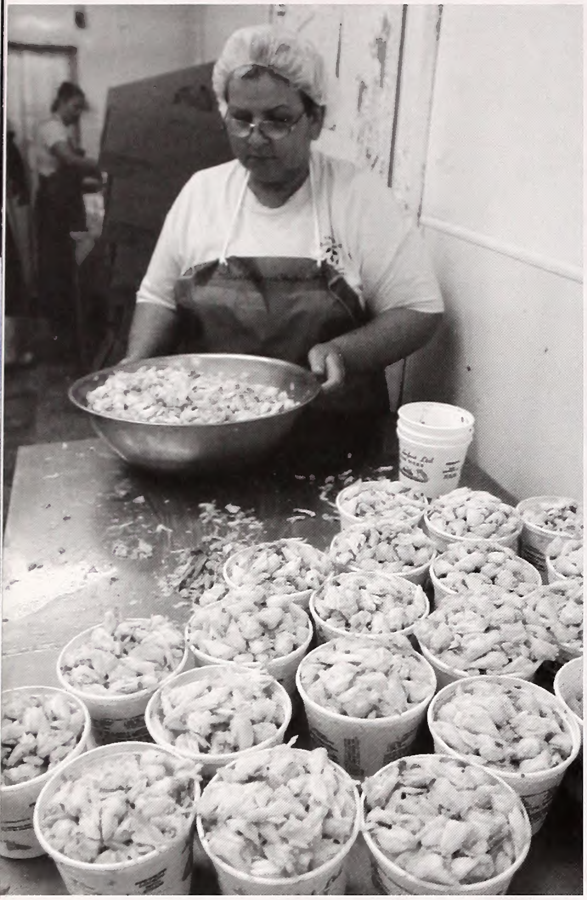
The success of the project, however, is more than numbers of products developed. Information that will be in the final report from the project can help other seafood processors, because, like it or not, global seafood competition has arrived in North Carolina.

ON THE WAY TO A GLOBAL MARKET

The crabmeat trade in North Carolina is older, probably, than the establishment of the state.

"It goes back to John White and the Lost Colony on Roanoke Island," says David Green, director of N.C. State's Center for Marine Sciences and Technology in Morehead City. Only then, crabs were a literal trade — between the settlers and native Americans.

Continued



Rosario Pachaco packs crabmeat, a traditional product for Sea Safari in Bellhaven. Photo by Scott D. Taylor

Over time, the blue crab industry grew into the state's most lucrative fishery. Then things started to change.

The shift in repartee around the crab-picking tables from "down east" brogue to Spanish was one sign. Local labor had gone elsewhere for dependable, year-round, more pleasant work. Meanwhile, catches of local blue crabs dwindled, and the crab season shortened. At the same time, an influx of less expensive, imported crabmeat was nudging out domestic market share.

Lingering effects from a series of hurricanes in 1996 and 1997 altered estuarine habitats, and the crab supply declined further.

The already struggling industry began to plummet. "We had an accelerated shift from domestic to imported products," Green explains. "We no longer can be commodity-based because we can't compete at the commodity level."

Although the changes were swift, they did not take processors by surprise, says Green.

"They actually saw it coming, but there was little they could do to counteract it," he says, citing a shift in supply from Asia and Indonesia to U.S. markets.

Jimmy Johnson, who works in sales at Sea Safari, bears witness to the changes in crab processing in recent years.

The sudden intrusion of a global market on the eastern shore of North Carolina translated into painful reality as many local processors, including Johnson, were unable to compete. The dream of Johnson and his wife, Donna, of owning her family's processing plant had become a reality in 1996.

"For a couple of years, it was a pretty good dream. Then it became a nightmare," says Johnson. "It got to the point where you could not produce crabmeat for any kind of profit."

"We had to sell the business or lose everything we'd worked our whole lives for," he says. Other processors also felt pressure.

Doug Cross of Pamlico Packing Company in Vandemere puts it like this: "Between government regulations and increased competition from various imports, the industry is changing. And it's not slowly but surely — it's happening pretty quick."

Nash is helping Cross with an FRG project to develop a line of seafood dips and salads with a six-week refrigerated shelf life for Pamlico Packing. They have 16 products now and plan to select the top eight before testing preservation systems devised through the FRG project.

Cross agrees that value-added products are important.

"It's another slice of the pie, I guess. But the pie is getting so thin now-a-days, you better have a lot of slices."

Nash compares the old style of crab processing to farming — offering a harvested product to a competitive market and hoping for the best. To survive, he says, "processors must transition from commodity-based to market-driven businesses."

That translates into what consumers demand.

COOKING UP WHAT CONSUMERS WANT

"People want to eat seafood. There just aren't enough attractive value-added items to satisfy consumers' needs," says Nash.

In particular, he says, they want food that is "healthful, flavorful and easy to prepare."

And Green notes that freshness counts. When consumers know the origin of crabmeat, he says, they prefer to buy local as long as prices are nearly equal.

Green adds that sensory evaluations at the seafood lab show consumers prefer the taste of blue crab over imported species. Without side-by-side comparisons, however, many consumers may lack that culinary sensitivity.

"Younger people coming in have grown accustomed to imports because they have never tasted the difference," Green says.

In addition to taste, there's convenience.

"The U.S. is geared to time-saving," says Green. "Seafood lends itself to that market because it's quick to prepare." Further preparation makes it even more convenient, he says.

Nash says ease to consumers means either "cooked ready-to-eat or heat-and-serve."

He notes that "the value of the packaged-foods market is estimated to be in the billions of dollars."

Convenience is paramount to Americans, who spend $118 billion annually on fast food, according to an article by *New York Times* food columnist Jane E. Brody. That statistic should be heartening to Sea Safari.

An oven-baked seafood patty developed by Harris and Nash is being eyed by a national fast-food chain. Nash says that "being oven-baked was what was appealing about it." The chain had wanted a seafood product that was baked instead of deep-fried — one that could meet their expectations for quality and convenience.

Most of Sea Safari's new products are frozen, bake-and-serve items that make a complete meal or entrée. They are being offered in some grocery stores.

The value-added line resulted from the synergy of the Harris-Nash team. Nash has more than 17 years of food-industry experience specializing in ingredient technology and product development. Harris says this and Nash's industry contacts have been invaluable.

Harris brings a background in chemistry and food safety management to the mix. The precision of a chemist is a good fit for food product development.

"Even when you're in your kitchen using a recipe, you're using chemistry," she says. And while it's useful knowing how to use chemicals in food processing when necessary, she says that Sea Safari tries to avoid preservatives.

But one reason the Harris-Nash duo is dynamic is that they represent the two things consumers seem to want the most from food — good flavor and convenience.

Nash likes good food, he says, but he would rather be outside hiking or kayaking than inside cooking or cleaning afterward. Convenience is for him.

Harris is a natural cook with long family ties to the coast and to seafood. "I've always enjoyed cooking," she says. "My mom is a really good cook."

Growing up in the coastal South had its own culinary advantages — like picking crabmeat out of stewed hard crabs at the tender age of five or six. It was a family thing.

"My granddaddy had a CB radio, and his handle was "Goose Creek Crab Eater," she says. "Who would have guessed that 20 years later, I'd be working in a crab facility."

To Harris, developing a new seafood product is like "working backward."

"You have to do a lot of research in the market to see what price point you have to hit … It's difficult to start with the price," she says, citing factors such as profit, labor, ingredients, freight and storage.

Sea Safari aims for mid-range in price, she explains. Not the most expensive, but not the least, either.

Her coastal roots have grown into her role as a seafood product developer. For the breaded items, like the catfish nuggets, Harris says the "breading" is a dusting of seasoned flour that allows the taste of the real food to come through and gives a pleasing appearance.

"The biggest problem to overcome with developing seafood products is having to realize it's not your own taste you have to please. You're trying to feed the masses. You have to know the target audience and make a formula to fit," she says.

The company should be able to hit almost any target with the variety of seafood products it now boasts. To its original value-added calamari and clam crisps, it now has a tantalizing assortment of seafood items. Crab, Corn and Jalapeno Popums, Crab Stuffed Fish Rolls and Shrimp Paella are just a few.

The acquisition of Ecrevisse Acadienne, USA in 1996 gave the company a product not usually associated with North Carolina — crawfish. With the FRG funding, Sea Safari has added Cajun Crawfish and Chicken Jambalaya, Crawfish Etouffee and Crawfish Creole to the repertoire. It's global marketing with an ethnic flair.

Nash says product development can take a year to 18 months. It means devising a product concept with the expertise, equipment and packaging required, plus microbial testing, shelf-life testing, analyses for nutritional labeling and sensory evaluation.

SEA CHANGE FOR THE CRAB INDUSTRY

"Our company is an example of where the industry is headed in the state if they're going to stay in business," Harris says. "It's important to develop partnerships with other seafood businesses."

One such partnership is between Sea Safari and Carolina Classics of Ayden to make the Buffalo Catfish Nuggets. "Carolina Classics supplies the catfish, and Sea Safari does the rest of the processing," Harris says. Both companies get a value-added product to sell under their own names in the bargain.

Green says that crabbers benefit from a healthy processing industry as well.

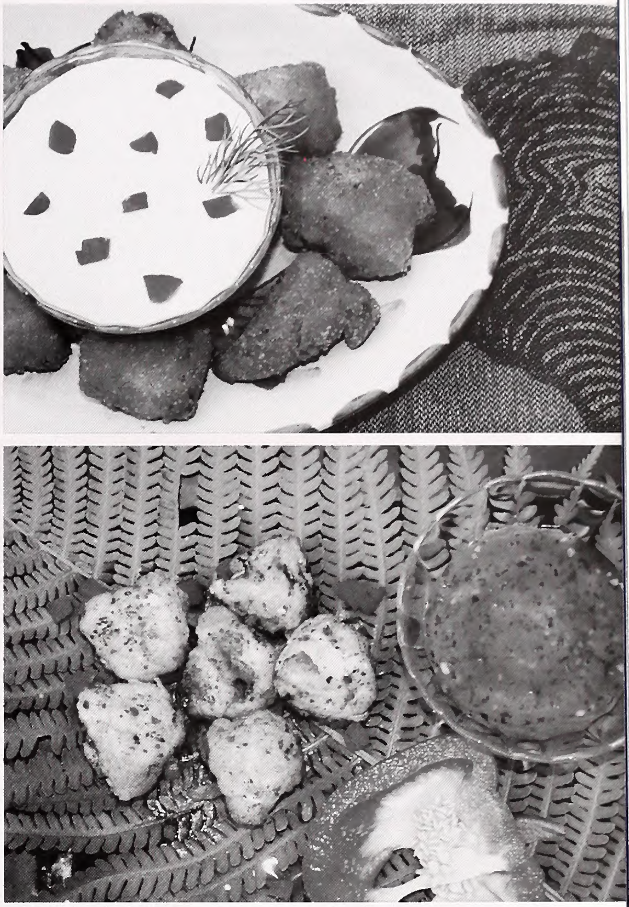
"There is a symbiotic relationship between crabbers and the crab-processing house," he says. "If the volume (of crabs) is high, the only way to sell is to the processing house. If many go out of business, the market is limited … last year both suffered because of lack of supply."

A shortage of processors restricts crabbers to a "live basket" trade, Green explains.

Some crab houses want to stay small to keep overhead low, supplying domestic crabs to a pricier niche market. But, Green says, "A big market depends on volume."

"Going to value-added, even with imports, can allow crab houses to stay in business and stabilize the workforce," Green says. "Processors need to manipulate supply, regardless of the source."

Green says Sea Safari is in the forefront with value-added items. "If one company has success, more will try it. Sea Safari is providing leadership and change for the industry," he says.



Sea Safari's value-added products include Buffalo Catfish Nuggets (top) and Lobster Nuggets (bottom). Photos by Donna Johnson

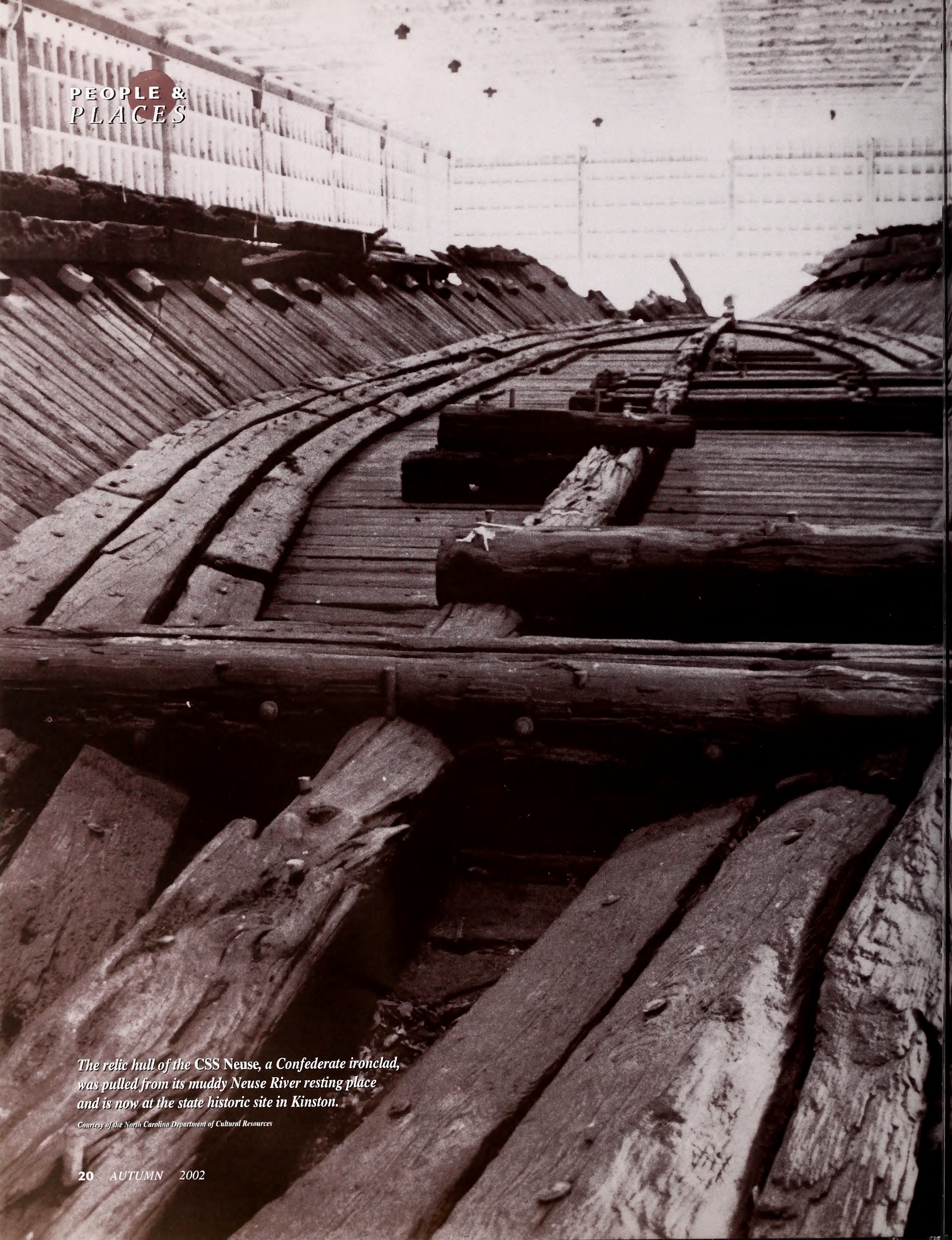
Harris emphasizes that Nash and the FRG program have helped tremendously with developing new products and can help other companies as well. The grant paid for an industrial breader and deep fryer that will stay with the seafood lab in Morehead for the use of other processors.

"You don't always know what equipment you're going to need," says Harris. By using equipment from the seafood lab, "you can get a better idea of what you'll need without the capital investment."

Harris encourages other seafood processors to take advantage of the resources at the seafood lab and the FRG program.

"The FRG program does work," she says. "It is there, it is available, and people need to take advantage of it."

For more information about the FRG program, go online to www.ncsu.edu/seagrant and follow research links, or call 919/515-2454 or 252/222-6312.



The relic hull of the CSS Neuse, *a Confederate ironclad, was pulled from its muddy Neuse River resting place and is now at the state historic site in Kinston.*

Courtesy of the North Carolina Department of Cultural Resources

CSS Neuse:
An Ill-Fated Ironclad

By Pam Smith

Few would argue that the *CSS Neuse* is an ill-fated Civil War "hero."

The Confederate ironclad was meant to play a glorious role in retaking New Bern from Union troops. From that strategic stronghold at the confluence of the Neuse and Trent rivers, the Confederate Army and Navy would protect crucial supplies moving along the Wilmington and Weldon Railroad line from the North Carolina port to Gen. Robert E. Lee's army in Virginia.

But alas, the *CSS Neuse* never moved far from her Kinston mooring on the Neuse River where she was being fitted with firepower and four inches of steel armor. Her cannons would be fired only a single time — not in a glorious offensive assault, but as part of an ineffective defense against enemy forces moving toward key Confederate forts.

The crew shelled the Union calvary advancing on Kinston. Then, to avoid capture, the *CSS Neuse* was set afire and sunk. For nearly a century, she lay buried in the muddy river bottom.

Her massive hull was recovered in the early 1960s and transported to its current humble resting place adjacent to the Richard Caswell Memorial that commemorates North Carolina's Revolutionary leader and first elected governor. The *CSS Neuse*/Richard Caswell Memorial Historical Site — one of more than two dozen historic places administered by the N.C. Department of Cultural Resources' Division of Archives and History — is an excellent destination for a fall day trip.

In spite of her less than glorious service in the Confederate Navy, the *CSS Neuse* tells an important and dramatic piece of Civil War history, says Morris Bass, site interpreter.

"The most fascinating part of the story is that the ironclad was the newest technology of its time," Bass explains. "And, remember, at the start of the war in 1861, the Confederate Navy had zero warships and was challenged to build a world-class navy. By 1865, the Confederate fleet had grown to 211 warships."

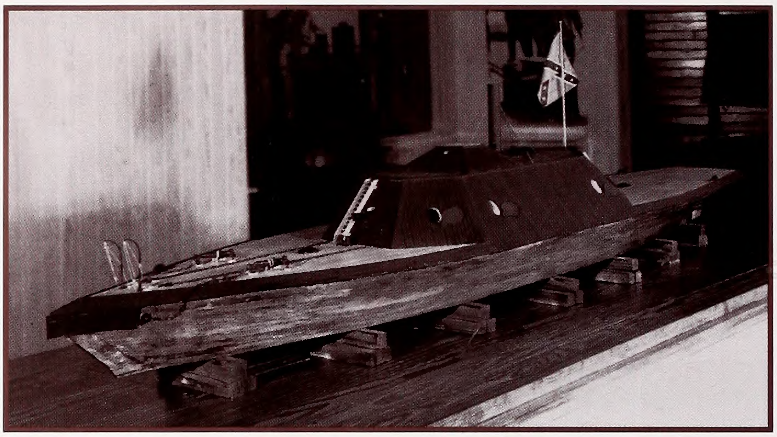
SETTING THE STAGE OF HISTORY

Nevertheless, by March 1862, New Bern had fallen to Union Gen. Ambrose Burnside and had become the center for federal forces in eastern North Carolina. Here, federal troops launched military operations, according to William C. Harris, Civil War and Reconstruction historian and North Carolina State University professor of history.

In a book Harris edited for University Press of Florida, *In the Country of the Enemy: Civil War Reports of a Massachusetts Corporal,* he calls the Wilmington and Weldon Railroad "the best protected railroad in the South." Along with the taking of key river towns, the Union troops pressed on to seize control of the Confederate railroad supply line.

So, in October 1862, the Confederate Navy ordered, "with the least possible delay," the construction of the *CSS Neuse*, one of 22 shallow-draft, ironclad gunboats it would build in the course of the war. The wood hull would be constructed at Whitehall, now Seven Springs, and then floated to Kinston to be fitted with munitions and armor.

Continued



A scale model of the ironclad is displayed in the visitor's center at CSS Neuse*/Richard Caswell Historic Site. Along with other artifacts, visitors may view a multimedia presentation about the ill-fated ironclad.*

Courtesy of the North Carolina Department of Cultural Resources

"The *CSS Neuse* was to have played a critical part in the defense of the region," Bass says. "The number one concern was to keep the supply line open. About 75 to 80 percent of all supplies traveled to Richmond on the Wilmington and Weldon Railroad line — and Kinston was on the front line of its defense."

However, work on the *CSS Neuse* progressed very slowly. Its arrival in Kinston was delayed by a Union raid through the area earlier in December 1862. One report in the Harris book describes the results of three successful expeditions by the Massachusetts 44th regiment, including the destruction of a railroad bridge.

The Union Corporal Zenas T. Haines writes:

On Sunday, our fourth day from Newbern, we were drawn up in line of battle about one mile from Kinston, a large rebel town on the Neuse. The duty of the right wing of the 44th was to deploy as skirmishers and pass through a swamp to the right of the road, which was defended by a strong rebel battery near the river.

Days later, Haines writes about Union soldiers advancing on Whitehall/Seven Springs, where the *CSS Neuse* was still under construction.

Finally floated to Kinston in 1863, wage disputes, and worker and material shortages further delayed its completion — and entry into battle.

A TURN FOR THE WORSE

By 1864, frustration was apparent among *CSS Neuse* officers. Letters from Confederate Lt. R.H. Bacot to his sister in South Carolina reveal his impatience. In March 1864, Bacot resided in Kinston, about a quarter of a mile from what he has dubbed the "Neus'ance."

Bacot writes:

I am afraid that name will prove but too appropriate. Her Iron Fixin's are not done her engines are not ready, her quarters and storerooms are not ready and last but not least the river is falling about 12 inches a day and we will have to trust Providence for another rise when the vessel is finished.

A month later, Bacot writes:

I have bad news to tell you this time. Even worse than I anticipated when I wrote last. The river has fallen and the CSS Neuse *is nearly high and dry on a sand bar just below Kinston. The river had fallen about six feet when we got orders to go down and there was scarcely water enough for us to cross the obstructions; we nevertheless started down last Friday and had proceeded about a half mile when we grounded on a sand bar. We tried very hard to get her off, but her great weight and the strength of the current were too much for us. Besides, the river was falling at the rate of 4 in's per hour. ...*

I assure you our disappointment was great when we found that we could not get off; the troops were here ready to join us in the attack on Newbern and we were all expecting to take the city and sink the gunboats without much trouble and to have a fine time afterwards. ... it does seem hard to be so sorely disappointed after expecting so much.

By January 1865, the war had taken a decided turn against the Confederacy. But Bacot seems optimistic and determined to be engaged in victory over the enemy. He writes to his sister:

We are not yet whipped and our people are not discouraged.

However, from Raleigh on March 27, 1865, Bacot writes of the final chapter of the ill-fated *CSS Neuse*:

My old home, the Neuse *is gone, all the troops were withdrawn from Kinston and the Yankees 18,000 strong came upon us and not having any prospect of being relieved before our provisions gave out and being in a narrow river where we could not work the ship under fire, after shelling the Yankee Cavalry for a little while, we removed our powder and stores and burnt the vessel.*

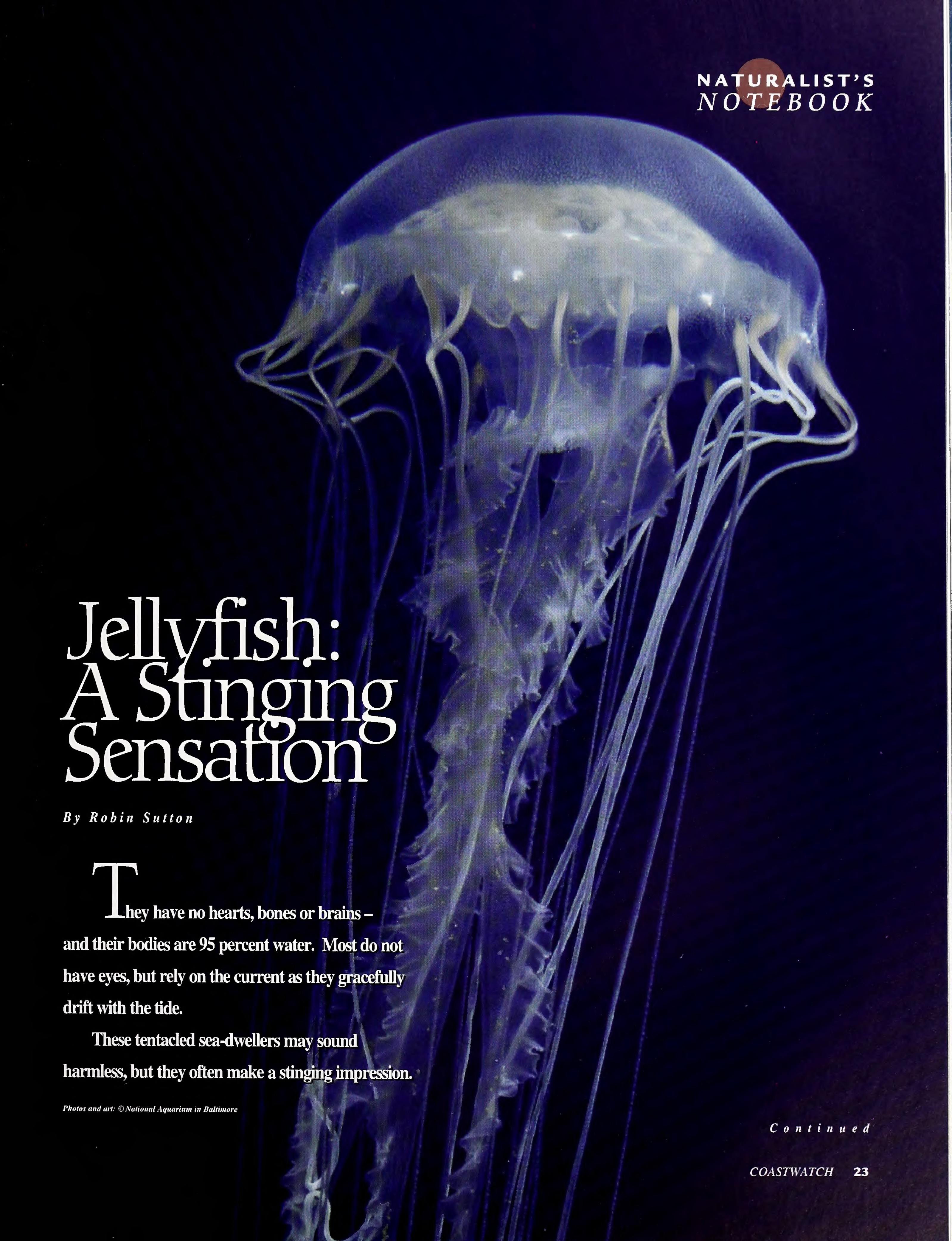
Historian Bass explains when the *CSS Neuse* was finally completed in April 1864, nature sealed its fate. It had been a very dry season, and Neuse River levels had fallen dramatically.

The ironclad steamed out of Kinston, only to be stranded on a sandbar. A slight rise in the river, he says, allowed the ship to return to its moorings the next month.

There it would remain until March 1865, when Union troops approached Kinston. *CSS Neuse* Commander Joseph Price realized there was no alternative but to scuttle his vessel. And on March 12, 1865, the *Neuse* was burned by the crew. A large explosion sank the ship.

The relic hull and other artifacts from the *CSS Neuse* are on view at the historic site. The ultimate goal for the site is to enclose the vessel in a climate-controlled facility. Free interpretive tours are offered daily. On Nov. 16 and 17, a Civil War Naval encampment will be staged.

Want to go? Take U.S. 70 Business at Kinston (West Vernon Street). The historic site is about a half-mile on the right. For fall hours, call 252/522-2091. For information about the CSS Neuse *on the Internet, go to* www.ah.dcr.state.nc.us/sections/hs/neuse/neuse.htm. *Or, select a search engine and key in* CSS Neuse.



Jellyfish: A Stinging Sensation

By Robin Sutton

They have no hearts, bones or brains – and their bodies are 95 percent water. Most do not have eyes, but rely on the current as they gracefully drift with the tide.

These tentacled sea-dwellers may sound harmless, but they often make a stinging impression.

Photos and art: © National Aquarium in Baltimore

Continued

Although an encounter with a stinging jellyfish is one that most swimmers are not likely to forget, many jellyfish are actually harmless. Still, sightings in North Carolina waters send swimmers scampering.

Jellyfish come in many shapes and sizes, from tiny, thimble-shaped Caribbean species to the Arctic lion's mane, whose bell can reach eight feet in diameter, and tentacles can stretch to 200 feet.

"Jellyfish have been on the Earth for over 650 million years," says Ken Bradley, education instructor at the N.C. Aquarium at Pine Knoll Shores. "So even though they're simple creatures in a lot of ways, they have been around longer than sharks — and even before dinosaurs."

Though they float mostly with the current, jellyfish are able to swim. Using a primitive kind of a jet propulsion, they push water in and out of their umbrella, or bell-shaped body. Usually they stay within saline waters up to 40 feet deep, but some are found in freshwater lakes. There are also deep-sea jellyfish in oceans all over the world.

Although jellyfish are composed mostly of water, a complex system of nerves allows them to smell and taste. Through touch receptors and light-sensing organs, they are able to react to the world around them.

Jellyfish are held together simply by muscle fibers laced through their bodies and connected to their mouths. Special sacks located around the rim of their bodies help them to maintain balance.

Long tentacles, trailing from beneath their bodies, have the same effect on prey as they do on innocent passers-by.

"They catch their food pretty much by luck," says Bradley. Whatever brushes against their tentacles is a candidate for their next meal.

When the tentacles touch a prey, the jellyfish first stuns it with stinging cells called cnidocytes. Each cnidocyte contains a tiny harpoon called a nematocyte. When touch or chemicals trigger the cnidocyte, the nematocyte not only shoots into the prey, but another toxin also is released to stun or kill the food. Then the oral arms, which cover the long tube where the mouth is located on its central surface, help the jellyfish to engulf its prey.

The East Coast sea nettle is commonly found in 80-degree coastal waters.

"Since a lot of jellyfish eat tiny zooplankton and other baby sea creatures, their stings are not strong enough to break our skin," says Bradley.

For the same reason, jellyfish prove to be tasty meals for turtles. "Any sea turtle — especially a loggerhead — loves jellyfish. They are able to eat them without worrying about the sting associated with it."

THE ODD ONES AMONG US

Joe Pawlik, professor of marine invertebrate zoology at the University of North Carolina at Wilmington, says that this year large numbers of the Portuguese man-of-war (*Physalia physalis*) were spotted along Wilmington area beaches.

"It's unusual to find so many making it to shore here because we usually have offshore breezes," says Pawlik. "But if part of the Gulf Stream breaks off and spins toward the coast, the wind carries their float as a sail.

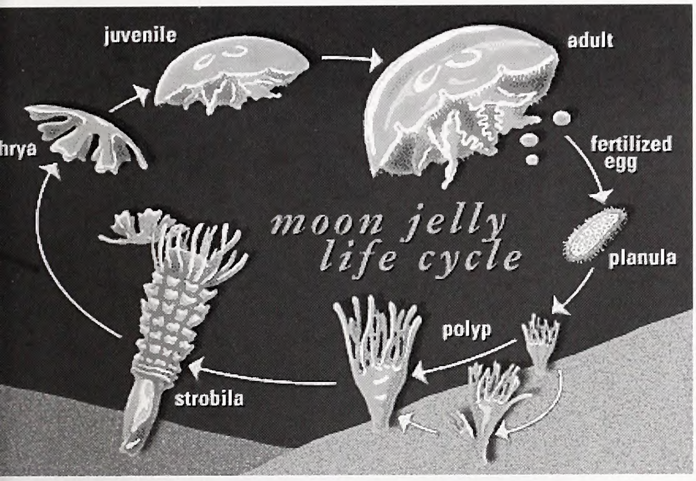
"Although the Portuguese man-of-war and the jellyfish are both jelly-like and they both sting, they are in completely different classes at the taxonomic level. It's basically the difference between a colonial and a noncolonial organism," Pawlik says.

The man-of-war is composed of a colony of animals with various organisms working together as one unit, whereas the jellyfish is only one organism. Though the man-of-war is more toxic, it is easier to spot — and avoid — since it floats above the surface. It is also visible by a vivid pinkish-blue body and tentacles that trail as far as 65 feet behind the umbrella.

Beachgoers here can relax knowing that they won't encounter the Australian box jellyfish (*Chironex fleckeri*), or the sea wasp. The most venomous animal on earth, its sting is more toxic than a cobra's, and it can kill a human in minutes, says Pawlik. These jellyfish can see, move toward prey and feed on fish.

However, a species of box jellyfish lives approximately 300 to 400 yards off the coast of Wrightsville Beach, according to Pawlik. He and colleagues brought up several of the jellyfish while trawling.

"Despite the fact that they were in our trawls, and we had every opportunity to get very badly stung, no one did. These do not



Life for a moon jelly is not as simple as it may seem.

appear to pack any sort of nasty sting." The jellyfish are six inches in length, and they hang out close to the bottom on sandy shores. "No one ever sees them because they don't float," he says. "When they die, they just decompose instead of being washed up on shore."

The Arctic lion's mane jellyfish (*Cyanea capillata*) is the world's largest jellyfish. But North Carolina has a smaller version.

"Around here, lion's mane jellyfish usually have a diameter of 8 inches across the bell, and their tentacles are around 6 feet long," says Paul Barrington, director of husbandry and operations at the Fort Fisher aquarium. The lion's mane jellyfish has a mass of pinkish-white hairy tentacle clusters that extend from the umbrella, and its color ranges from fuchsia to purple.

TREATMENT AND HEALTH BENEFITS

Julie Brewer, health center director at Camp Seagull, a camp for boys on the Neuse River in Arapahoe, says that she and her staff treat about four mild jellyfish stings a day. "It depends on the current," she says. "Some weeks when the wind comes in, it blows a lot of jellyfish our way."

When the campers are stung, Brewer applies vinegar, which keeps the nematocysts from being fired. "We just spray a mixture of half vinegar and half water on the affected area, and that usually makes the redness go away," she says.

The American Red Cross cautions against rubbing affected areas or applying fresh water or ammonia, both of which increase pain. If pain or swelling worsens, seek medical attention.

"Different people are subject to different levels of sensitivity," says Pawlik. "It's the same as a bee sting. Sometimes people are extremely allergic — and the stings can be fatal — while others are barely affected." In some cases, severe symptoms include respiratory distress, muscle cramps or dizziness.

For swimming peace of mind, there is a new sunscreen called *Safe Sea*, which blends lotion with an enzyme that is secreted by clownfish. According to Bradley, clownfish often live in close contact with jellyfish and go without harm because their enzyme disables a jellyfish's nematocytes. "So if a jellyfish comes into contact with a swimmer using *Safe Sea*, the nematocytes are not activated," he says.

In spite of the intimidation associated with their stings, most jellyfish are harmless — and many are quite beneficial.

According to Bradley, jellyfish often produce a green glow when they are aggravated, and scientists at the University of Manchester in England have used that glow to track cancer in humans. "The scientists put the DNA that gives that glow into a yeast, and then they introduce it into the body," says Bradley. "The yeast will give off that green glow in the places where it gets aggravated by the cancer."

Several jellyfish derivatives are being used to treat not only forms of cancer, but also arthritis, Alzheimer's and heart disease. If such contributions to health research continue at their current rate, a jellyfish's sting soon may seem like a small price to pay for its priceless benefits.

And, Bradley reflects, "They aren't intentionally going out and stinging people. They're just responding to a stimulus — it's a way of survival." ◘

THE LOCALS

Most North Carolina jellyfish scarcely live up to their reputation. Some of the most common are:

- The **moon jellyfish** (*Aurelia aurita*) is one of the most widespread. It is sometimes found in huge swarms, and is recognized by its disk-shaped body and white to pink coloring. Its tentacles are short, and its sting only causes a mild rash that may itch for a few hours.

- The **cabbagehead jellyfish** (*Stomolophus meleagris*), also called the cannonball jelly, is nearly spherical. It has no tentacles, but does have short oral arms that hang down just below its bell. The cabbagehead jelly feeds on small particles in the plankton, but people cannot perceive its sting.

- The **mushroom jellyfish** (*Rhopilema verrilli*) can grow up to one and a half feet across. It is easily breakable because of its size, and like the cabbage head, it has no tentacles. Its oral arms resemble long, fleshy fingers. In China and Japan, this low-calorie delicacy is served pickled but also may be dried and turned into a paste.

- The **sea nettle** (*Chrysaora quinquecirrha*) has a pale white body that resembles the spokes of a wheel. It has few, but long, tentacles that sting, leaving wounds that last up to a few weeks. It is commonly found beginning in August, when its young hatch in 80-degree waters.

Quality Key to International Seafood Standards

By Katie Mosher
Photos by Scott D. Taylor

Seeing — and tasting — hybrid striped bass was a treat for Durita Nielsen, of the Danish Institute for Fisheries Research.

Until her visit to North Carolina, she had never worked with many of the species that make up our coastal aquaculture and marine fisheries industries. A native of the Faroe Islands, located northwest of Scotland and halfway between Iceland and Norway, she's much more familiar with sealife in cooler waters of the northeast Atlantic.

But it was not her expertise in a specific species that brought Nielsen to the North Carolina State University Seafood Laboratory in Morehead City. Rather, her visit, sponsored by North Carolina Sea Grant, was designed to share overall European quality assessment methods.

"North Carolina has a long history of providing quality seafood. We want to make sure that our seafood industry will be able to sell the highest quality seafood anywhere in the world," explains Ronald G. Hodson, North Carolina Sea Grant director.

Seafood safety — including intensive programs such as Hazard Analysis and Critical Control Points training — has been a focus of the U.S. seafood industry in recent years. But the industry also must match international standards for quality of fresh fish, adds David Green, seafood lab director.

Thus, Nielsen arrived in North Carolina to share the Quality Index Method, or QIM, a standard established by the QIM Eurofish Alliance in Denmark, the Netherlands and Iceland.

"The goal of this project is to improve overall acceptability of fish by ensuring the highest quality and best industry handling techniques," says David Green, director of the seafood lab. "QIM provides the basis for developing national and international markets based on agreed-upon standards."

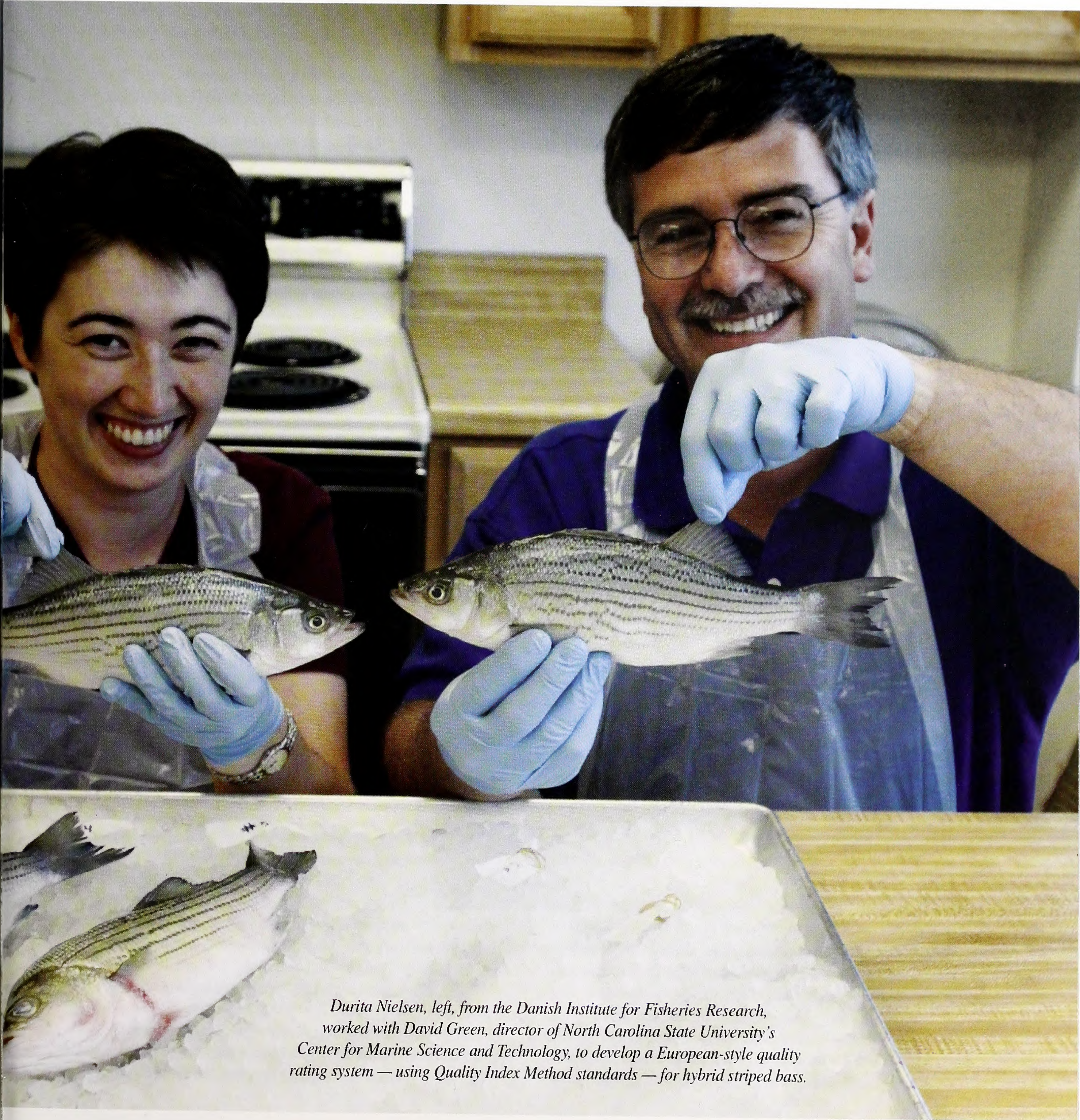
SETTING QUALITY STANDARDS

QIM sets objective measurements of certain attributes or "sensory properties" for raw fish, Nielsen explains. QIM can be used to determine the shelf life — or more specifically the on-ice life — of fish used in processing or sold in markets.

"It is very easy to use in the industry," she says, citing the protocols established for salmon, a major export for the Eurofish countries. "You don't need to be a scientist."

In fact, even the consumer can use the straightforward process. "Every household could learn to use this method," Nielsen explains.

Continued



Durita Nielsen, left, from the Danish Institute for Fisheries Research, worked with David Green, director of North Carolina State University's Center for Marine Science and Technology, to develop a European-style quality rating system — using Quality Index Method standards — for hybrid striped bass.

TOP: Nielsen and Green check various aspects of the fish condition, such as skin color, scales and gills. BOTTOM: The QIM assessment uses many senses — including smell — to evaluate the quality of fish that has been stored on ice. RIGHT: In addition to her quality research, Nielsen also learned about North Carolina seafood by participating in a Nutrition Leaders session at the NC State Seafood Laboratory.

Standards are established for each species, with individual parameters offering scores ranging from zero to three. The lower the score, the higher the quality.

For salmon, a pearly skin color and shine would have a score of zero, while a yellowish color near the abdomen would rate a score of two. Similar evaluations are listed for the skin mucus and odor, as well as for various aspects of the eyes, gills and abdomen.

QIM inspectors evaluate a minimum of three fish from a larger group to provide an average score for the lot. That number is then compared against a calibration scale to determine the relative freshness and remaining storage days on ice.

In Europe, software allows inspectors to use hand-held computers to input the scores, then receive quick and reliable assessments. The software even includes photographs to guide the inspector in matching the fish at hand to the proper score.

So far, QIM outlines, known as schemes, are in place for 12 European species, including cod, haddock, sole, shrimp and pollock.

"The key benefit of QIM is that the method provides the user — producers, buyers, sellers and retailers — with a reliable and standardized freshness measure of a product," Eurofish literature explains.

INITIAL N.C. EFFORTS

When Green learned of QIM at international meetings, he thought the process would complement an N.C. Fishery Resource Grant (FRG) project designed to improve handling of hybrid striped bass.

"This tool is exactly what we needed to help quantify the quality differences in the current FRG project with Pure Water Farms and Bioxy Inc. We believe the technique will be useful for the industry and for researchers," Green says.

And once they become familiar with the QIM process, the seafood lab will work with the commercial fishing, seafood processing and aquaculture industries to develop similar evaluation tools for other North Carolina species.

The Danish experts suggested Nielsen as a visiting scholar for the project.

"During her one-month stay with us, we performed sensory evaluations on whole hybrid striped bass on ice," Green explains. The fish were provided by Vanguard Fisheries and White Rock Fish

Farm, both in Vanceboro, and Pure Water Farms in Creswell.

Researchers gathered a panel to evaluate hybrid striped bass during storage periods of 14 and 21 days. Those descriptions were the basis for the scheme or scorecard listing various aspects, such as eyes, skin and gills. The researchers even sampled two fillets for edibility and smell. Those scores were correlated with the remaining shelf life.

The preliminary scheme was then shared with HSB growers Ted Davis of White Rock Fish Farm and Steve Locke of Castle Hayne Fisheries, who suggested additional quality parameters.

"They were very pleased to see the results of Durita's work and expressed an interest in pursuing the technique as a way to differentiate North Carolina-grown HSB from other suppliers," Green says, adding that the project will be discussed with other N.C. fish farmers during an industry meeting.

Green and Nielsen will fine tune the HSB scheme, which they expect to present at the Trans-Atlantic Fisheries Technology Conference in Iceland next year. "This meeting will go a long way in educating other countries about North Carolina-grown hybrid striped bass and to demonstrate the industry's interest in meeting quality standards on an international basis," Green says.

INTERNATIONAL EXPERIENCE

The project also fits objectives set by the seafood science "theme team" for the national Sea Grant network. Hodson and Jim Murray, former North Carolina Sea Grant extension director who now heads extension efforts of the National Sea Grant College Program, are co-chairs of the team.

"Our research project addresses the need to develop international research programs that share information for mutual benefit, rather than fueling competitive trade practices," Green says.

Hodson agrees. "The development of quality assessment methods like QIM for the U.S. and North Carolina seafood industries also will ensure that our industries can meet the demands of seafood consumers anywhere in the world," he says.

In many cases, foreign seafood producers have technological superiority, Murray adds. Thus a theme team report recommends that Sea Grant assist the U.S. seafood industry by encouraging international exchanges and by promoting internationally acceptable systems to evaluate product quality and food safety.

"The bilateral exchange with Denmark is a good example of how Sea Grant can assist the industry to remain internationally competitive," Murray says.

The project also provided a bridge between cultures on personal levels. It was Nielsen's first visit to the United States — and the first opportunity for many North Carolinians to learn about the Faroe Islands and Denmark.

North Carolina's summertime heat and humidity provided some challenges, but Nielsen found the community welcoming and the new seafood delicious.

While working at the seafood lab, Nielsen stayed with Janie Jones, director of the Carteret County Civic Center, and Charles Jones, regional director for the N.C. Division of Coastal Management.

In addition to her QIM work, she tested seafood recipes with retired Sea Grant seafood specialist Joyce Taylor and the Carteret County Nutrition Leaders, and worked with a local seafood processor to test recipes for value-added seafood. Nielsen also worked on the NC State main campus, learning new techniques for measuring texture in fish fillets with Sea Grant researcher Tyre Lanier and colleague Christopher Daubert.

Nielsen even had a visit to Core Banks and Cape Lookout arranged by Karen Amspacher, director of the Core Sound Waterfowl Museum. There, David Yoemans offered stories and songs describing colorful aspects of local history.

"I would love to come back," Nielsen says with a smile. ◘

For more information on the Quality Index Method, go online to www.qim-eurofish.com. *For information on the Danish Institute for Fisheries Research, go to* www.dfu.min.dk.

Sea Grant

NORTH CAROLINA SEA GRANT
NORTH CAROLINA STATE UNIVERSITY
BOX 8605
RALEIGH, NC 27695-8605

ADDRESS SERVICE REQUESTED

PERIODICALS
POSTAGE PAID
AT RALEIGH, NC

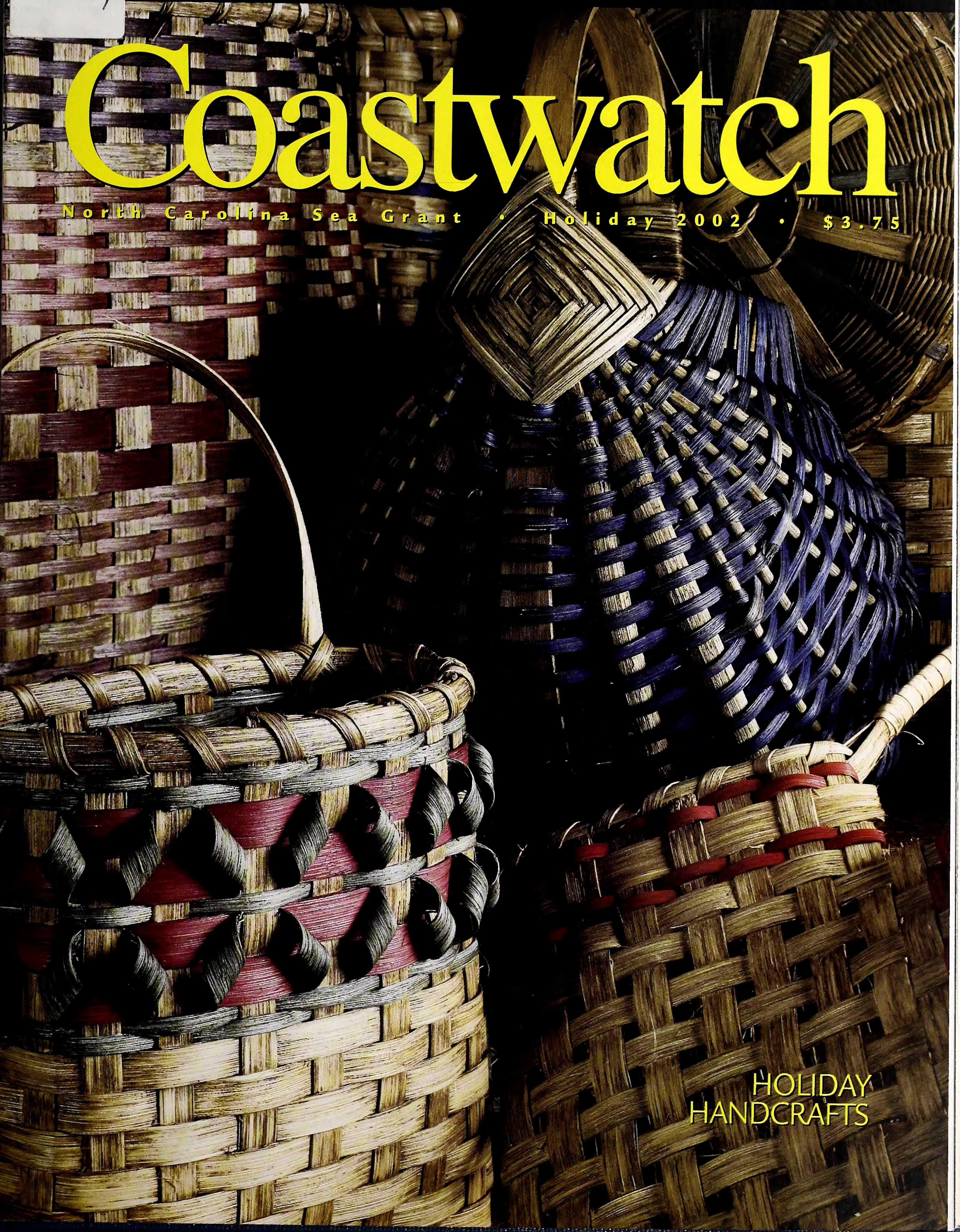
COASTWATCH

G69
7:2002/6

-VIEW LESSONS • ESTUARIES • EELGRASS

Coastwatch

North Carolina Sea Grant • Holiday 2002 • $3.75



HOLIDAY
HANDCRAFTS

Island Gifts

Herman Lankford

North Carolinians, and the millions of visitors to our beaches each year, already have received a pair of wonderful presents this year.

In October, two properties were dedicated as preserves — available for nature walks and impromptu science lessons. They also provide homes for important species and offer critical natural filtration of our waters.

In Brunswick County, a new coastal reserve on Bird Island includes nearly 1,300 acres of beach, marsh and wetlands used by several threatened or endangered species, including Kemp's ridley and loggerhead sea turtles, the piping plover, wood stork and black skimmer.

Located just off Sunset Beach, the island is the 10th site in the reserve program administered by the N.C. Division of Coastal Management (DCM). The $4.2 million needed for the acquisition came from the N.C. Clean Water Management Trust Fund (CWMTF), Natural Heritage Trust Fund and N.C. Department of Transportation. Learn about the state's National Estuarine Research Reserve Program in Pam Smith's story on page 16.

Along the state's central coast, Morehead City's annual Seafood Festival drew tens of thousands to the city's waterfront. But, many visitors may not have realized that they were just a stone's throw — well, maybe farther than I can throw — from Sugar Loaf Island. Now, don't worry if you didn't know the island's name. It has had several names since it was created in the 1920s from dredge spoils.

City officials worked with the N.C. Coastal Federation to obtain funding from CWMTF and DCM to purchase the island. Eventually, they will develop a nature trail with limited visitor facilities.

The following poem was presented at the Sugar Loaf dedication. The words are by Rodney Kemp — and Sandra Munns has set it to music.

SUGAR LOAF ISLAND

Enigmas, conundrums, questions, mystery
Have always been the basis of history
Tying down the Sugar Loaf name
Has not been an easy game.
It's the only name I ever knew
And I've been here a year or two
But some folks say they can't recall
It's ever having a name at all.
It started out as just a lump
But grew and grew with every dump
Of black mud dredged — an ugly sight
'Til bleached by the sun to snowy white.
At Christmas time the only white ground we'd see
Was when we'd get a tree
From Sugar Loaf — it was an attraction
As skiffs were poled in its direction.
Previous owners in history have been connected
Dr. Ben Royal, Gordon C. Willis and Charles S. Wallace were respected
But Charlie North Bennett with his forward vision
Eventually led to the town fathers' decision.
To name it a natural ground preserve
Is what the Morehead folks want and deserve
We spend this time in dedication
Of Sugar Loaf Island's resurrection.

During dedication ceremonies, State Treasurer Richard Moore recalled his childhood vacations to Atlantic Beach and the thrill of going to restaurants on the Morehead City waterfront.

His kids, he says, are getting the same view — and, so too, will future generations.

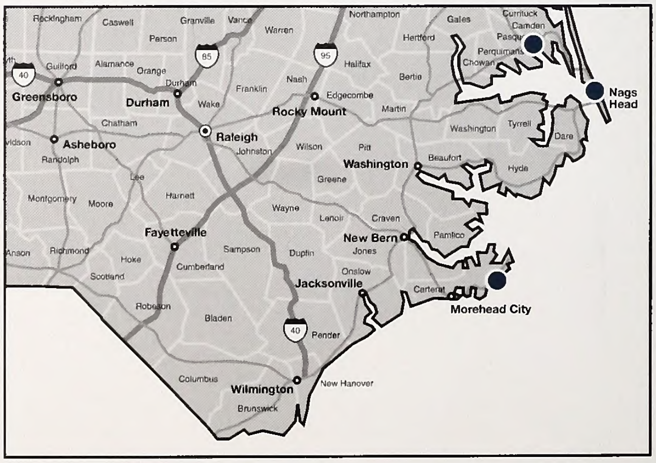
Katie Mosher, Managing Editor

IN THIS ISSUE

Contributing Writers:
Ann Green ▫ Cynthia Henderson ▫ Robin Sutton
Katie Mosher ▫ Pam Smith ▫ Jason Talley

Contributing Photographers:
Ven Carver ▫ Michael Halminski
Herman Lankford ▫ Ken Taylor ▫ Scott D. Taylor

North Carolina's diverse coast offers countless interesting subjects. The large dots on the locator map indicate story settings in this issue — including Camden, the Outer Banks, and Carteret County.



Coastwatch

N.C. DOCUMENTS
CLEARINGHOUSE
NOV 14 2002
STATE LIBRARY OF NORTH CAROLINA
RALEIGH

FEATURES

COASTAL TIDINGS 2

WATERMARK:
CRAFTING A COLORFUL HISTORY
Watermark, one of the oldest craft cooperatives in the country, reflects coastal culture and traditions — from baskets to carved decoys. Pam Smith visits the Camden artisans as they prepare handcrafted items for the holiday season. 6

SEA-VIEW:
TEACHERS WINDOW INTO BARRIER ISLAND PROCESSES
Follow teachers and students as they investigate coastal issues during a North Carolina Sea Grant workshop on the Outer Banks. The teachers and students will incorporate the lessons into earth science materials for high school teachers. 12

ESTUARIES: LIVING RESEARCH LABORATORIES
Imagine a laboratory as big as all outdoors. That's the scope of the North Carolina Estuarine Research Reserves. Explore the Rachel Carson reserve with researchers and visitors as they make amazing discoveries about the estuarine environment. 16

SEA SCIENCE:
Eelgrass: Binge Eaters in the Estuary
Sea Grant researcher Brant Touchette shares imporant findings on eelgrass — a critical player in the estuarine environment. Find out how nutrient-rich waters may be contributing to eelgrass decline. 22

MARITIME MORSELS:
Seafood Dishes Are Tasty Holiday Fare
Oysters are in season in North Carolina from October through April. Marlene Hieronymus shares a delicious cornbread-oyster dressing and other seafood recipes that make for a festive holiday meal. 26

BOOK MARKET:
Lasting Holiday Gifts
Robin Sutton takes readers shopping for books with a North Carolina coastal connection. Each is just right for holiday giving — and receiving. 28

Coastwatch

Managing Editor
Katie Mosher

Senior Editors
Ann Green
Pam Smith

Contributing Editor
Cynthia Henderson

Designer
L. Noble

Circulation Manager
Sandra Harris

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, North Carolina Sea Grant supports several research projects, a 15-member extension program and a communications staff. Ron Hodson is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina. *Coastwatch* (ISSN 1068-784X) is published six times a year by the North Carolina Sea Grant College Program, North Carolina State University, Box 8605, Raleigh, North Carolina 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. Subscriptions are $15. E-mail: katie_mosher@ncsu.edu World Wide Web address: *http://www.ncsu.edu/seagrant* Periodical Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch,* North Carolina Sea Grant, North Carolina State University, Box 8605, Raleigh, NC 27695-8605.

Sea Grant
North Carolina

Front cover photo of baskets courtesy of Watermark Association of Artisans. Table of contents of photo rag doll by Michael Halminski. Printed on recycled paper.

COASTAL TIDINGS

Photos by Scott D. Taylor

Knauss Fellows Head for Nation's Capital

Two North Carolina scholars are heading for the nation's capital as Dean John A. Knauss Marine Policy Fellows for 2003. They will spend the coming year learning about federal policy-making processes that affect the ocean, coastal and Great Lakes resources.

Lisa Manning *(left)*, a graduate student at the University of North Carolina at Chapel Hill's Institute of Marine Sciences, and Larissa Nojek *(right)*, a graduate student at Duke University's Nicholas School of the Environment and Earth Science, were selected for the prestigious fellowship. The fellowship, valued at $38,000, is sponsored by the National Sea Grant College Program.

Manning, who is from Minnechaug, Mass., earned a bachelor of science degree in biology from Bates College in Lewiston, Maine, and completed a semester in the Williams-Mystic Maritime Studies Program.

Before entering the doctoral program in biology, Manning was a guest lecturer in biological oceanography and a research assistant at the Institute of Marine Sciences. She currently is studying the ecological impacts of beach nourishment, a Sea Grant-funded project.

Nojek, who is from Springfield, Va., is completing a master's degree in environmental management with a concentration in coastal zone management. She earned a bachelor of science degree in environmental earth science from Mary Washington College.

Before entering graduate studies at Duke, she worked as an environmental analyst and consultant for a Virginia-based firm. At Duke, Nojek is researching the use of remote sensing on the Pamlico Sound, with water quality and policy implications.

The fellowship program honors Knauss — a Sea Grant founder and former dean of the Graduate School of Oceanography at the University of Rhode Island.

For information about applying for the 2004 Knauss Fellowship program, go online to *www.ncsu.edu/seagrant.*

– P.S.

In the Next Issue of *Coastwatch*

Ann Green takes readers inside some historic cottages at Cape Lookout National Seashore. Jason Talley goes whale-watching along North Carolina's winter coast. And, Pam Smith learns the latest science of flounder aquaculture.

Weather Station Getting Facelift

Ven Carver

For more than 100 years, the old U.S. Weather Bureau station at Hatteras Village has been exposed to winds and rains from numerous storms.

Now, the residence, observation building and storage buildings are getting a facelift.

For the last year, the National Park Service has been restoring the outside and inside of the wood-framed structure, including new foundation and structural repair of chimney, windows, doors, porches and roof.

Built in 1901, the yellow two-story residence is the first official building constructed to record weather for the U.S. Weather Bureau. Until 1952, the main building was the official residence of the person in charge of weather observations and his family.

"It's a grand old place," says George Perrot, Cape Hatteras National Seashore historic preservation specialist, Outer Banks Group. "The building is of historical importance because it is the only architecturally designed station of its kind remaining in the federal system."

One unusual feature of the residence is an observation room with a ship ladder to the roof walk that overlooks the Pamlico Sound.

The total cost of the renovation, which is expected to be completed in 2003, is about $765,000, according to Perrot. The station will be open to the public. — A.G.

New FerryMon Web Site

Courtesy of N.C. DOT Ferry Division

These are no ordinary passenger ferries. Three vessels in the state's fleet are equipped with high-tech instruments to monitor water quality during regular crossings of the Pamlico Sound and the Neuse River.

The ferries are central to FerryMon, a research project designed to detect sudden or subtle changes in this important estuarine system, and to guide a management response.

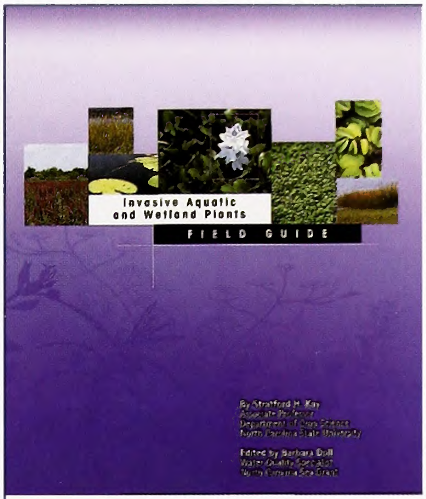
A new Web site, *www.ferrymon.org*, presents ongoing analytical information that "speaks to the public."

FerryMon was commissioned by the N.C. Department of Transportation Ferry Division in partnership with scientists from the Duke University Marine Laboratory and the UNC-Chapel Hill Institute of Marine Sciences, and the N.C. Department of Environment and Natural Resources. FerryMon was launched two years ago, funded in part, by North Carolina Sea Grant.

The "research ferries" include the *M/V Carteret* — the Cedar Island-Ocracoke ferry that crosses the southern Pamlico Sound and Ocracoke Inlet — and the *M/V Gov. Hyde* — the Swan Quarter-Ocracoke ferry that crosses the central Pamlico Sound.

In addition, the *M/V Floyd J. Lupton* crosses the Neuse River 40 times a day between Cherry Point and Minnesott Beach — a location that has periodic algal blooms, low-oxygen bottom waters and periodic fish kills.

On-board instruments transmit the data to computers at Duke's Beaufort lab for analysis. Scientists and state officials say data could be used to quantify the relationship between human activities and water quality. — P.S.


Invasive Aquatic
and Wetland Plants
FIELD GUIDE

By Stratford H. Kay
Associate Professor
Department of Crop Science
North Carolina State University

Edited by Barbara Doll
Water Quality Specialist
North Carolina Sea Grant

New Field Guide from Sea Grant

A new publication from North Carolina Sea Grant, *Invasive Aquatic and Wetland Plants Field Guide*, targets natural resource field personnel and home water gardeners alike.

Waterproof from cover to cover, the booklet identifies 21 species of greatest national or regional concern. Entries feature color photographs, line drawings and descriptions of growing conditions and range.

Sea Grant and the North Carolina State University Crop Science Department prepared the field guide as part of a National Sea Grant initiative. In addition to the book, a Web site was developed by the University of Florida's Center for Aquatic and Invasive Plants. Go on line to *http://plants.ifas.ufl.edu*.

Copies of the field guide are available for $15. Call 919/515-9101 and ask for publication number UNC-SG-01-15. — P.S.

Fisheries Association Celebrates 50 Years

Courtesy of N.C. Fisheries Association

Members of the North Carolina Fisheries Association gather on the Capitol steps during a 1955 visit to D.C.

Fifty years ago, five men formed the North Carolina Fisheries Association. Now, 1,000 members work on behalf of commercial fishing families, crabbers, dealers, packers and related businesses.

Formed with the goal to ensure that every American table has fresh seafood — and that the children of North Carolina will have the opportunity to grow up and fish for a living — the NCFA continues to be an advocate for the commercial fishing industry.

There are different levels of membership forming this advocacy group, from the primary members to the locally based auxiliary organizations comprised of spouses and other members of commercial fishing families.

The NCFA is involved in a wide variety of public awareness projects, seeking to present an accurate portrait of the commercial fishing industry. These efforts include the publication *Tradewinds*.

Reflecting on the group's history, president Jerry Schill says, "for a group like ours, it is usually what 'didn't happen' rather than a particular issue we push." What didn't happen is peat mining in Hyde county, net and trawling bans, and many other issues that affect commercial fishing in North Carolina, he adds.

What *is* happening is the 50th anniversary celebration, which culminates at the 17th Annual Fish Baron's Ball and Silent Auction on Nov. 9 in New Bern. For more information call the NCFA at 252/633-2288, or go online to *www.ncfish.org*. – J.T.

Core Sound Museum Receives Loan

With support from the U.S. Department of Agricultural Rural Development program, the Core Sound Museum is completing construction of an education hall/community center.

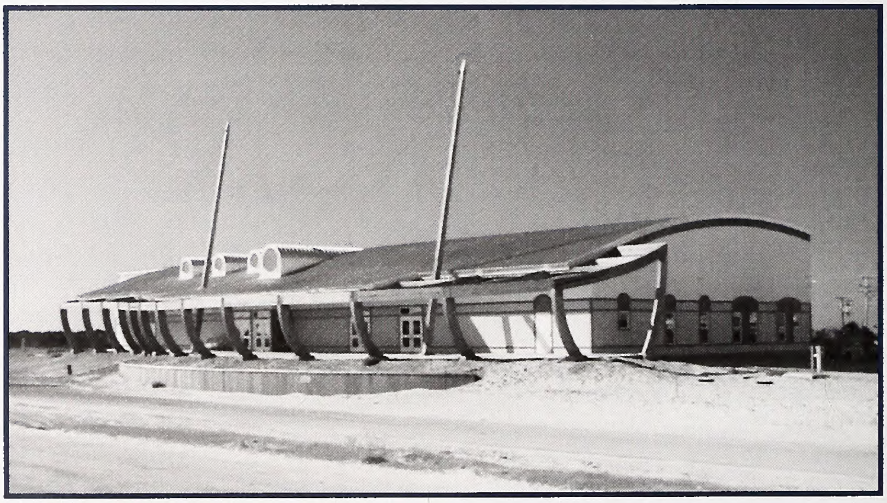
The museum on Harkers Island received a $450,000 low-interest loan from the agricultural program.

"This loan — which is a temporary solution — will allow us to move into the building early next year and carry out the museum's mission as an educational and economic resource for our community," says Karen Amspacher, museum director.

Since being approved for the loan, the museum has secured more than $140,000 in new gifts and pledges.

When open, the museum will highlight decoy making and other traditions in eastern North Carolina.

To find out more about the museum, visit the Web: *www.coresound.com/museum.htm*. – A.G.



Courtesy of Graveyard of the Atlantic Museum

New Shipwreck Museum Opening

Over the years, the treacherous waters off Cape Hatteras have entombed thousands of vessels and countless mariners.

The new Graveyard of the Atlantic Museum commemorates the Outer Banks' rich maritime history.

A small portion of the museum on Hatteras Island will open this fall, including a small exhibition space, museum store and community room.

The 19,000-square-foot museum, which is located at the end of Hatteras Island near the ferry dock, is a stunning structure designed in the shape of a ship.

In 2003, the museum will feature a major exhibit on Gen. Billy Mitchell, in conjunction with the First Flight Celebration.

To find out more about the museum, visit the Web: *www.graveyardoftheatlantic.com*. – A.G.

COASTAL *TIDINGS*

North Carolina: A Great Place to Visit

North Carolina was the sixth-most-visited state in the country in 2001 – just behind California, Florida, Texas, Pennsylvania and New York – according to an annual wrap-up report from the N.C. Division of Tourism.

Shopping, beaches, outdoor activities and historical places and museums – in that order – attracted about 43 million visitors. That translates to nearly $12 billion spent across the state. Tourism generated $694.8 million in state tax revenue, $397.6 million in local tax revenue, and directly supported 196,400 jobs.

Three coastal counties made the top 10 list in travel impact among North Carolina's 100 counties: Dare County ranked fourth in the state; New Hanover, eighth; and Brunswick, tenth.

Dare tourists spent $519.6 million dollars in 2001 – a 4 percent increase over the previous year. The most popular tourist attractions in the county included the Cape Hatteras National Seashore, the Wright Brothers National Memorial and Fort Raleigh National Park, which includes the Lost Colony Outdoor Drama and the Elizabethan Gardens.

Charlotte, the 2001 home to Discovery Place, the Panthers, Carowinds and the Hornets, ranked first in travel impact. For county-by-county information about the economic impact of tourism in North Carolina, go online to *www.nccommerce.com/tourism*. – P.S.

Net Gains Through Grants

It's an ongoing dilemma for commercial fishers: how to catch more marketable fish while minimizing harm to other species.

Glen Montgomery of Beaufort rose to this challenge through a Fishery Resource Grant to test ways to reduce bycatch in the North Carolina inshore gill net flounder fishery. FRG, which is funded by the N.C. General Assembly and administered by North Carolina Sea Grant, allows fishers and others in seafood-related industries to try out ideas for protecting or enhancing coastal and marine resources.

Flounder gill nets typically are supported vertically by weights at lower edges and floats along the tops. Height of the nets is determined by tie-downs — shorter, evenly spaced pieces of heavy twine connected from top to bottom lines.

While effective at catching flounder, the nets also can entrap sea turtles, diving birds and other bycatch.

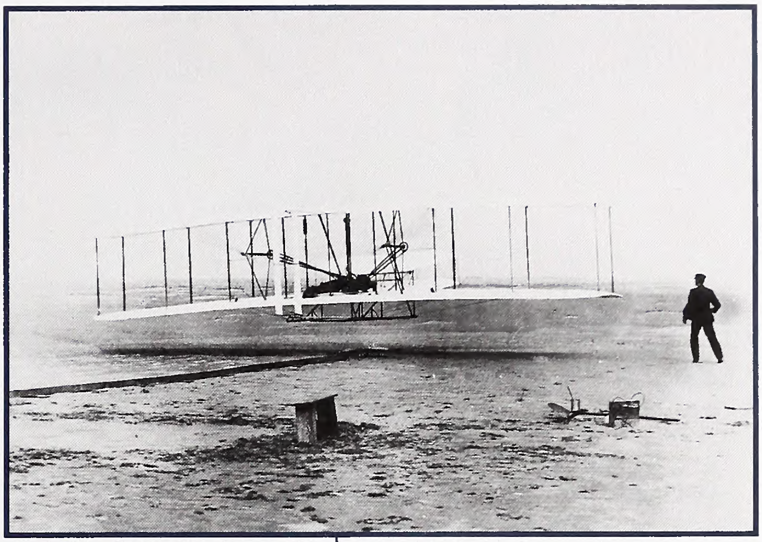
Montgomery reasoned that removing float lines could reduce bycatch by keeping nets close to the bottom — where the flounder are. Through FRG, he tested his nonfloat nets against nets with floats, both with and without tie-downs.

He found that nonfloat nets caught significantly less nonmarketable bycatch, slightly more flounder, and proved more durable than nets with floats. He shared his findings at the 2002 Commercial Fishing Show.

The deadline for proposals for the 2003 FRG funding cycle is Dec. 2. Research priorities include new equipment or gear, aquaculture/mariculture, environmental pilot projects, and seafood technology.

For more information on the FRG program, visit the Sea Grant Web site at *www.ncsu.edu/seagrant* and follow the research link or call 919/515-2454.

– C.H.



Courtesy of N.C. Office of Archives and History

The Wright Brothers made their first flight on the Outer Banks.

First Flight Celebration

Almost 100 years ago – on Dec. 17, 1903 – the Wright Brothers made their famed flight over the sand dunes at Kitty Hawk.

To celebrate the Wright Brothers' phenomenal feat, the First Flight Centennial Celebration kicks off on Tuesday, Dec. 17, 2002, at the Wright Brothers National Memorial in Kill Devil Hills with a flyby.

Throughout 2003, events will be held at the Wright Brothers National Memorial, including a Summer Concert with the U.S Coast Guard Band on June 9 and the Commemoration of Gliders on Oct. 10-11.

The National Park Service will host the "grand finale" of the First Flight Centennial Celebration at the Wright Brothers National Memorial December 13-17, 2003. The celebration features five days of exhibits, speakers and demonstrations, including a re-enactment of the first powered flight on Dec. 17, at 10:35 a.m. and 2 p.m.

For more information, visit the Web: *www.outerbanks.org* or *www.centennialofflight.gov*. – A.G.

Courtesy of Watermark Association of Artisans

WATERMARK:

Crafting a Colorful History

By Pam Smith

A colorful quilt provides a backdrop for what could be a corner of Santa's workshop. Rag dolls sit in painted wagons waiting for just the right child to come along and take them on a merry ride. Stuffed monkeys climb the shelves. And, an old-fashioned bed doll with a very haughty look seems impatient for the holiday party to begin.

The quilt, it turns out, is much more than a decorative prop. It's a history — each square is a chapter representing the contribution individual artisans have made to the Watermark Association of Artisans since its 1978 founding.

And the collection of dolls, children's furniture and wooden toys are part of an adventure that could begin another successful chapter in the story of the 500-member craft cooperative. Hundreds of Watermark folk crafts are being featured for the holiday season in a shop at the trendy Georgetown Park Mall in Washington, D.C.

But we're getting ahead of ourselves.

Courtesy of Watermark Association of Artisans

ABOVE: Hammered metal art comes to life at the hands of a skillful Watermark artisan. LEFT: The rich coastal culture is reflected in many craft forms, such as these colorful painted fish ornaments.

Watermark, located on U.S. 158 East in Camden, began with about 25 charter members. It quickly gained national attention for its high-quality Carolina crafts — and its mission to provide meaningful income for artisans in the sparsely populated, rural northeastern region of the state.

Early on, forward-thinking Watermark members began to cultivate national wholesale markets that could provide volume sales for its shareholder members. Soon, the QVC shoppers' channel offered Watermark merchandise, and Ralph Lauren contracted for special products. Watermark hand-painted buttons — each unique — were featured on Esprit clothing.

Today, about 5,000 lucky little girls are clutching Watermark's Sara doll, which was produced exclusively for Smithsonian Institution shops.

But, wait a minute. How can home-made, hand-crafted items be both one-of-a-kind *and* produced in volume?

It's easy to explain when you know the history. Watermark artisans could provide all the human capital and creative energy needed to produce unique merchandise. But the members realized the need for hard cash. So, the Northeast Education Economic Development Foundation (NEED) was established to bring in grant dollars that could be used to train the members in a range of craft skills to ensure product quality.

Say a QVC contract called for Watermark hand-painted stools. NEED grants would underwrite the cost of the necessary raw materials as well as training workshops for a cadre of Watermark artisans needed to produce the quantity and quality.

From the start, NEED training looked to help the women develop craft skills, business skills and personal skills — ingredients for self-sufficiency. A child-care facility also was established to provide a safe environment during the training sessions.

NEED has since evolved to become the Northeastern Community Development

Continued

Courtesy of Watermark Association of Artisans

Michael Halminski

TOP: Willie Jimerson began carving as a youngster looking to earn extra pocket money. BOTTOM: Far from the sandy shoreline, a starfish and small shells melt into a new candle environment created by Sally Knuckles.

Center (NCDC). The center still provides training workshops for Watermark artisans. Its child-care facility has expanded and serves all the community.

LEARNING SELF-ESTEEM

For many long-time Watermark members, the training program has made a world of difference in their lives.

Take Jocelyn House, whose painted glass iced tea set is pictured on the front cover of *Panache*, an international mail order catalogue. Her glassware, with a painted grape cluster motif, also was the featured item in Gevalia coffee's spring catalogue.

Never in her wildest dreams did she think that could happen. That is, never in her pre-Watermark dreams. The co-op provided the opportunity to hone her artistic skills and gain the self-confidence needed to market her products and herself. Now, House trains other artisans in the fine points of glass painting and design. "It's a way to give back," she says.

House also has become competent in other crafts to help fill large, special project contracts.

That might mean helping with production of traditional rag dolls — the love of Beverly Cupery's life. The dolls come in various sizes and with different hair colors, including powder blue, pink and orange.

It was Cupery's Sara doll that passed Smithsonian's rigorous muster. "Sara came with four different skin colors, so she had a lot of international appeal," she says. "It took about six months to produce enough to fill the contract."

She is proud to have helped give Watermark that kind of public exposure. But she is just as proud to be part of an outreach effort closer to home. Cupery and House regularly team up to bring arts and crafts to special needs children in the Elizabeth City and Camden schools.

"We enjoy sharing our gifts with others," she says. "And the kids just open up."

Diane Poole, too, is a long-time Watermark member. She learned a number of handcrafts growing up in the Camden area. "But I always wanted to learn to carve," she confesses.

So, when Watermark offered a wood carving class, she was first in line.

"It's something I think I must have in me. My father, grandfather, great and probably great-greatgrandfather were boat builders. My dad told me stories of my grandfather, Alvery Wright, who built shad boats and carved decoys. He died when I was an infant, and I felt like I could connect with him if I could just learn to carve," Poole explains.

One of her grandfather's shad boats is on display at the Museum of the Albemarle in Elizabeth City. And, long after his death, one of his decoys brought a tidy $25,000 at a decoy festival.

Poole's love for birds, especially local songbirds, is reflected in her wood carvings. She says she talks to them as she coaxes them out of wood blocks, carving, then painting lifelike details.

Watermark has given her confidence to try new things, she says. She has designed, and taught others to produce, lap desks for the Georgetown Park Mall project. And another creative idea is taking form — painting on bird feathers she collects, and then mounting them in a shadowbox. She is toying with the idea of using natural bark material for the matting.

Her husband, Al, also is a Watermark member. Together, they create and paint children's and doll's furniture also on display in Georgetown.

BRANCHING OUT

Dee Sprouse, who has been Watermark's executive director for less than a year, is leading a reorganization of the co-op. She will provide her marketing and fund-raising expertise.

In her office, Sprouse flips through scrapbooks that are filled with newspaper and magazine articles telling of Watermark's milestones. Videotapes contain snippets of television feature stories on Watermark. Even Gloria Steinem visited Watermark to support the co-op's economic development work. And, Watermark was honored at the 1994 Women's World Conference for promoting economic justice.

Watermark is a model craft cooperative, Sprouse says. "Watermark has helped local women find independence. And, we have provided training for women from many countries through grants from USAID."

Women from several African and Latin American countries have traveled to Watermark to complete the training program in order to replicate the co-op model in their villages.

There is a lot to be proud of, Sprouse reflects, closing the scrapbook. She takes a small, framed picture from her desk.

"This is the federal angel, an ornament selected to adorn the Christmas tree in the White House Blue Room in 1993," Sprouse says. The ornament, made by Watermark crafter Katherine Wassink, holds a miniature basket by another member, Marie Hewitt.

"We have evolved, and are still evolving," Sprouse notes. "We are building on the strength of our own history."

At one time, nearly all the members were women. In recent years, more men have joined the co-op.

Willie Jimerson is one. The retired carpenter used to

Continued

Courtesy of Watermark Association of Artisans

Michael Halminski

TOP: Santa Claus is among the array of Watermark offerings coming to the Georgetown Park Mall for the holiday season. BOTTOM: Jocelyn House puts finishing touches on hand-painted glass items featured in national mail order catalogues.

Michael Halminski

Michael Halminski

TOP: Long-time Watermark members, Beverly Cupery and Dotty Farrell have lost count of the hand-sewn crafts they have produced. BOTTOM: Willie Jimerson, a retired carpenter, is surrounded by some of Watermark's most sought-after holiday items.

specialize in restoring woodwork in old homes. Now, he produces one of the most sought after Watermark holiday items — an abstract wood-carved nativity set.

Jimerson began carving as a youngster, making and selling key chain trinkets to earn movie money. His first Watermark product was a Santa on skis.

"I branched out after that proved to be a success," he recalls. His repertoire includes a number of collectible carved items and a cheerful hound dog just for fun.

Watermark, too, is branching out with some new product lines to meet consumer wants, Sprouse says. "You could say we're evolving now to meet new global market expectations."

That will not mean any compromise in quality. "Watermark products always will stand out as professional, high quality and polished," Sprouse says.

She sees Watermark's strength in the combined energy and talent — and sometimes connections — of its members.

The Georgetown Park Mall retail opportunity, for example, came about because a Watermark member knows the leasing agent. "We are excited about this temporary tenant arrangement. We're open to a longer arrangement if we are successful with holiday sales," Sprouse says.

Meanwhile, Sprouse has engaged 16 sales representatives to present Watermark products to a number of new wholesale outlets. And a major distributor has agreed to represent Watermark at important craft shows in Atlanta and Philadelphia. What's more, Watermark continues to be featured in national mail order catalogues.

Expanding wholesale markets, Sprouse says, will bring greater income to Watermark artisans.

Board member Karen Peterson is coordinating a new training initiative for members. "Training continues to be an important part of Watermark's mission," Peterson says. "It's the only way to have the number of artisans needed to get product volume to a critical mass for special projects."

Quality training turns self-taught crafters into polished artisans, she adds.

Branching out will not mean abandoning traditional Carolina crafts. "There is a rich craft tradition here," Sprouse says. "So much of the area culture is reflected in our products."

Water themes. Boat themes. Shorebird themes. Baskets made with sedge and pine needles. Candles with decorative sea shells. Quilts.

That won't change, Sprouse says. "We will find ways to develop new crafts that follow emerging trends."

While she keeps the business side of Watermark going, she continues to help members in big and small ways.

"Transportation is a problem in rural areas," she says. So, Sprouse personally helps get members to training sessions, delivers supplies, picks up finished products — and delivers members' well-earned paychecks.

Their earnings are based on just how much time they put into the endeavor. For those who consider Watermark a full-time job, the sky is the limit. Others supplement their "day jobs" by producing crafts at home on a part-time basis.

HUMAN CAPITAL

Jack Thigpen, North Carolina Sea Grant's extension director and coastal community extension specialist, believes that Watermark will continue to make a positive impact on the northeast region of the state.

While many North Carolina coastal communities are experiencing phenomenal growth, Camden is one of more than a dozen counties in this sector of the coastal plain considered "economically distressed" by the N.C. Department of Commerce.

"According to the Department of Commerce, the per capita income and average wage in these rural counties are about 20 percent below the statewide levels, and unemployment is above state averages," Thigpen points out.

In addition, this region, which has 5 percent of the North Carolina population, is not expected to keep up with projected population growth for the rest of the state in the next decade.

"By creating opportunities for local residents to earn money and develop their skills, Watermark is increasing the human and community capital that will make a difference in the long run," Thigpen says.

Sprouse will continue to work with the NCDC to secure grants to help train new members and "cross train" others. Watermark is one of the essential employers in Camden and neighboring counties, with about 500 members and another 40-plus on the membership waiting list.

"We want to be the top community co-op," Sprouse says. "Working together, we can accomplish anything. Watermark has always been known as the co-op that cares. Watermark helps members develop self-esteem and self-awareness. And members help members grow."

She adds, "I know the future is bright for Watermark. A lot of talent and a lot of heart goes into all of our products. That hasn't changed and won't change."

So there it is. The colorful Watermark memory quilt truly is a symbol of the collective talent that has shaped its history — so far.

The Watermark Association of Artisans is located at 150 U.S.158 East in Camden. For information, call 252/338-0853. Or go online to www.watermarkusa.com.

Michael Halminski

Michael Halminski

TOP: Diane Poole's love for the coast is reflected in much of her work.
BOTTOM: Dee Sprouse, now at the helm of Watermark, says a lot of heart goes into the every Watermark product, such as these traditional decoys.

Sea-View:

Teachers' Window into Barrier Island Processes

By Ann Green • Photos by Michael Halminski

It's early in the morning as East Carolina University professor Stan Riggs stands on a wooden platform and surveys the towering sand dune at Jockey's Ridge State Park.

Before trekking up the beige dune imprinted with shadows and hundreds of footprints, Riggs encourages a group of teachers and students to "envision how much sand they will push down."

"A lot of people go up this hill each day," says Riggs, a North Carolina Sea Grant researcher. "When you climb the dunes, think of the process and envision the volume of sand you are pushing down. If you put 10,000 people on the hill and each one goes up and down five times, the human force becomes a significant part of the dune dynamics. We are pushing down the dune."

Over the years, Riggs says, the dune system at Nags Head has shrunk in size from 156 feet in the 1950s to 90 feet today.

The erosion of Jockey's Ridge is just one lesson that Riggs imparts to North Carolina high school science teachers and students during a North Carolina Sea Grant workshop.

During an eight-day visit to the Outer Banks, Riggs takes 10 teachers and eight of their students from across the state to view barrier island processes and conflicts, including the severely eroding shoreline at South Nags Head.

"It was fascinating going to South Nags Head," says Flo Gullickson, a Southwest Guilford High School science teacher. "We found a home with an exposed septic system. You could smell the raw sewage. There were lots of sand bags. Some of the homes at South Nags Head are falling in the ocean."

Teachers and students will incorporate the lessons into earth science materials for North Carolina high school teachers.

Funded by North Carolina Sea Grant, the "Sea-View" materials will relate to the curriculum goals set in the N.C. Standard Course of Study.

Since the 2000-2001 school year, every entering freshman has been required to complete a course in earth/environmental science for graduation. This makes North Carolina one of only two states in the country to have an earth science graduation requirement, according to Bill Tucci, high school science consultant at the N.C. Department of Public Instruction.

"North Carolina has become a model for the whole country," adds Tucci.

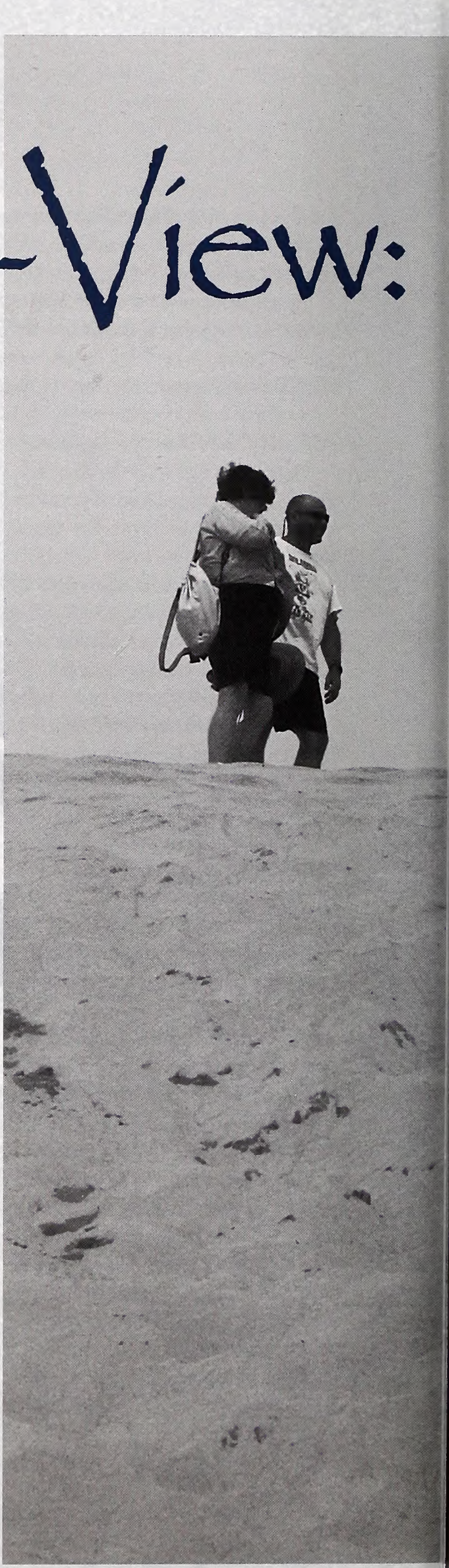
Currently, there is not a good textbook available for earth science teachers, according to the project's principal investigator Karen Dawkins. "Earth science books focus primarily on principles of geology with little attention to environmental topics," she adds. "There are probably few issues more critical than those related to our marine and coastal resources."

A team of high school teachers and students, university faculty, and experts from various state agencies will develop Sea-View earth science lessons that will be in print, on CD-ROM and the Web.

Coastal Hot Spots

To learn about barrier island dynamics, teachers and students investigated issues at five coastal sites: the stabilization at Oregon Inlet, overwash on N.C. 12 between Avon and

Continued



Buxton, estuarine shoreline erosion at Nags Head Woods, ocean shoreline erosion and urban development at South Nags Head, and dune migration at Jockey's Ridge.

"We chose the Outer Banks because it provides good examples of barrier island processes and conflicts in North Carolina," says Dawkins.

For Freedom High School student Eva Lee, this was her first glimpse of the rough waters of the Atlantic. "I just kept looking at the waves," says Lee of Morganton. "I now understand" the power of the sea, she adds.

This program gives students a unique opportunity to participate in the curriculum process early in their educational experience.

For the project, Dawkins selected experienced science teachers who had participated in Earth-View, a National Science Foundation project that educated earth science teachers about the geology of the Appalachian mountains, piedmont and coastal plains. The select group of teachers received extensive field experience and developed leadership skills.

"Sea-View is a natural extension of Earth-View," says Dawkins, director of ECU's Center for Science, Math and Technology Training. "Over three years, 10 teachers have developed a comprehensive picture of North Carolina's geologic history and the human impacts on our valuable resources. Sea-View is a wonderful opportunity for them to use their knowledge and skills at a different level."

Dawkins conceived the idea for professional development in earth/environmental materials for teachers in 1999 after conducting a statewide survey of school superintendents regarding the new required course in earth/environmental science.

"Only a small percent of teachers had any earth science background," says Dawkins. "Almost none had earth science certificates. A large number were biology or chemistry teachers who were asked to teach earth science."

Although all slots for earth science teachers in the state's public schools are filled this fall, Tucci says that many teachers are "underprepared."

"Because earth science includes four content areas — geology, astronomy, meteorology and environmental issues — it is hard to find a teacher who is prepared in all these areas," he adds. "Staff development efforts like Earth-View and Sea-View are making genuine progress toward preparing teachers to address the environmental issues in the Standard Course of Study."

Lundie Spence, North Carolina Sea Grant marine education specialist, agrees.

By initiating Sea-View, Dawkins is "taking a new leap in the development of earth science materials for high school and middle school," says Spence, the project's faculty advisor.

"Identifying coastal hot spots where natural systems are in conflict — with impacts on people — and then developing lessons makes science relevant," she adds. "The use of Web and digital technology will make the product more accessible and exciting to North Carolina teachers and students. Other states also will be able to use the materials to compare our state's hot spots to their own hot spots."

Experienced Leaders

Dawkins and Riggs bring different expertise to the program.

Since 1990, Dawkins has been providing professional development programs for science teachers in elementary, middle and high school at North Carolina State University and ECU through the N.C. Mathematics and Science Network. Before working at the university level, Dawkins was a high school science teacher for more than 20 years.

On the field trip, Dawkins is both a mother figure and mentor to the teachers and students. She leaves the field trips early to prepare home-cooked meals for the participants. During meetings, she encourages students and teachers to work together and collect good data, including rich descriptions and accurate sketches and measurements on their field trips.

"I find that the work with teachers provides a tremendous intellectual challenge and boosts my creative juices terrifically," says Dawkins.

TOP: Karen Dawkins has organized numerous workshops for North Carolina science teachers. BOTTOM: Stan Riggs shows teachers and students peat samples from the shoreline at Nags Head Woods.

Riggs brings a research perspective to the teachers and students.

For 35 years, he has studied the origin and evolution of the world's continental margins, including climate and sea-level change. His work has taken him from coastal plain rivers in North Carolina to the outer edge of the continental shelf.

Riggs also has taken numerous teacher groups on field trips. Last summer, he led an Earth-View trip at the juncture of the coastal plain and piedmont in northeastern North Carolina. In 2000, he gave teachers a first-hand look at the aftermath of Hurricane Floyd in a Sea Grant-sponsored workshop, a spinoff of Operation Pathfinder.

"This is the third trip I have taken with Stan," says Martha Buchanan, a teacher at Freedom High School in Morganton. "He is

TOP: Jockey's Ridge State Park was opened in 1975 as development began encroaching around Nags Head. BOTTOM: Sea-View workshop participants dig into the sand dunes to find the ground water at Jockey's Ridge.

doing a great service to North Carolina by putting material in layman's language so high school students can understand it."

When educating students and teachers about coastal processes, Riggs is passionate and energetic. For almost four hours straight, he leads students and teachers over Jockey's Ridge and through Nags Head Woods. The only time he stops is to pick up a piece of charcoal or sand or show a map of aerial photos of development around Nags Head from 1932 to today.

"These photos are like watching a person grow up," he says. "The 1932 photo shows when the first road was built and the dune at Jockey's Ridge was very large and expanded over a large area."

By the 1960s, there was some development around Nags Head.

Ten years later, contractors began building houses on top of dune fields, including portions of Jockey's Ridge and Seven Sisters dune fields, eventually eliminating the Seven Sisters dune field, according to Riggs.

"The water lines blew out, and septic systems filled with sand," adds Riggs. "Every house had to be bulldozed. Today's aerial photos show very little undeveloped land area."

Maritime Forest

At Nags Head Woods Ecological Preserve, Riggs leads the teachers and students, who are loaded down with backpacks and water bottles, deep into the diverse maritime forest, managed by the Nature Conservancy.

When the group gets to the edge of the forest, they trek through a vast marsh to a severely eroding estuarine shoreline.

"Much of the marsh doesn't exist anymore," says Riggs. "The shoreline erosion is a product of rising sea level. The loss of wetlands and uplands in coastal North Carolina is between 1,000 and 2,000 acres per year."

After looking at the shoreline, the group wades through the brackish water and looks for eroded blocks of peat.

"High-wave energy breaks off large blocks of peat," says Riggs.

For the teachers and students, the hands-on experience is invaluable. "It makes science a little easier when you can apply it to everyday life," says Kim Whitley, a Perquimans County High School student.

John Blake, a North Whiteville Academy teacher, agrees. "This experience will give me some new strategies to take back to my community," says Blake. "I will be applying some of the concepts learned to the Lumber River Basin and wetlands in Columbus County."

After the field trip, the students and teachers divide into groups.

The next day, they conduct beach profiles. The South Nags Head group takes photos of homes in the surf with septic problems.

"We learned so much about beach erosion rates because it is so pronounced at South Nags Head," says Buck Bunch, Perquimans County High School teacher. Some of the cottages that are oceanfront lots now were on the second and third row from the ocean 15 years ago, he adds.

Team Work

By creating a partnership between students, teachers and university people, you get a much richer product, according to Dawkins.

"We couldn't have assembled a better group of people for the task," she says. "The days were long and hard and hot — but the teams performed their work with great enthusiasm. We didn't have one whiner in the group. As a result of their work, we have a treasure trove of observations, measurements, photos, videotapes and interview notes that will serve as the raw materials for the finished product."

By the end of the week, the students and teachers are ready to interview elected officials, business people and government representatives.

"We learned that you need to look at different perspectives when dealing with an issue," says Bunch. "Scientists, property owners and officials have different viewpoints. You need to get everybody's input to make a good decision."

Next summer, the materials will be refined. During the 2003-2004 school year, teachers will test the products, which will include inquiry-based lessons.

"By the end of the project, approximately 60 teachers will be using the materials with more than 1,800 students," says Dawkins.

She hopes that the new earth science resources will give students a broader perspective about the North Carolina coastal environment.

It's not hard to see that many of our citizens have misused some of our most valuable natural resources, but this is due primarily to a lack of education, says Dawkins. "One way to solve this problem is to help students weigh important issues," she adds.

"The ultimate goal is to develop informed citizens, beginning with high school students and teachers." ■

Doug Smith, Joyce Bolo, Henry Bolo, Christie Stevens and Peter Bolo 'herd' fiddler crabs on the shoals of the Rachel Carson Estuarine Research Reserve.

ESTUARIES: LIVING RESEARCH LABORATORIES

By Pam Smith • Photos by Scott D. Taylor

"Watch this. I'm herding fiddler crabs!"

The youngster bends down to get a closer look as the fiddlers — led by a red-clawed, dominant male — race away en masse from her advancing steps.

Others in the group join her in a semicircle near the water's edge. They watch the crabs react to the expanding and contracting perimeter of their "corral."

"This is cool," proclaims the girl.

The behavior of thousands of fiddler crabs that surface at low tide on the shoals of the Rachel Carson Estuarine Research Reserve is one of the discoveries that will amaze this mixed-age study group.

Led by John and Mary Ann Davis, retired educators-turned-volunteer-guides, the group's arrival by ferry coincides with the low tide — when part of nature's hidden world is temporarily exposed.

Though they'll cover only a fraction of the 2,000-plus acre island complex in the course of their day trip, the study group will sample the biodiversity and importance of this productive estuarine environment.

Estuaries are defined as places where the fresh waters from rivers and streams mix with the salt water from the ocean. This is, to say the least, an oversimplified explanation of a complex system that provides wildlife habitat and the spawning and nursery grounds for important commercial finfish and shellfish.

North Carolina boasts more than two million acres of tidal inlets, sounds and bays, saltwater marshes and freshwater swamps, maritime forests and shrub thickets, and freshwater and brackish creeks. These diverse estuarine ecosystems support food-chain "supermarkets" that sustain aquatic and other wildlife.

Continued

LEFT: Volunteer, John Davis, helps identify some of the participants' amazing discoveries at low tide in the pristine estuarine waters.

RIGHT: Monica Dozier Powers, a National Estuarine Research Reserve fellow, is conducting important research on habitat preferences of the red drum — the state's popular saltwater fish. At the Rachel Carson Estuarine Research Reserve, they seem to prefer oyster reefs — where prey items are plentiful.

The larger picture

The federal Coastal Zone Management Act of 1972 created the National Estuarine Research Reserve System to provide states with matching funds to preserve, protect and manage these important coastal and marine resources.

The Rachel Carson Estuarine Research Reserve near Beaufort is one of four in the North Carolina National Estuarine Research Reserve (NCNERR) program. The others are Currituck Banks near Corolla, and Masonboro Island and Zeke's Island near Wilmington.

Another six uniquely sensitive coastal sites are part of the state's broader, protected coastal reserve system. These include Kitty Hawk Woods, Buxton Woods, Permuda Island, Bald Head Woods and Bird Island. The Emily and Richardson Pryer Buckridge reserve in Tyrrell County is the state's first inland reserve site — and the largest, with 18,000 acres of important freshwater wetlands.

The N.C. Department of the Environment and Natural Resources' Division of Coastal Management oversees the estuarine reserve program in partnership with the National Oceanic and Atmospheric Administration (NOAA), other state and federal agencies, and a number of nonprofit conservancy groups.

In North Carolina, the estuarine reserve program is a management tool, says John Taggart, reserve program manager. The multiuse reserves are protected from development, but they are *not* "no-take" zones or off limits for recreational use, as is the case in some states.

Taggart heads a team of five full-time staff members charged with research, management, education and outreach responsibilities.

"The North Carolina National Estuarine Research Reserve Program was established in 1982 to preserve these natural areas and the variety of life they support — and to learn from them," Taggart explains. "Essentially, the reserves are living laboratories for research and education."

The 10 sites also represent thousands of acres of prime coastal real estate that are becoming islands in a sea of rapid coastal development. Increasing resource pressure underscores the need to understand the relationship between human activity and these vast ecosystems, Taggart says.

The Rachel Carson research reserve, for example, is an undisturbed island complex just across from Beaufort — one of the prime communities in the rapidly growing middle coast region.

Déjà vu

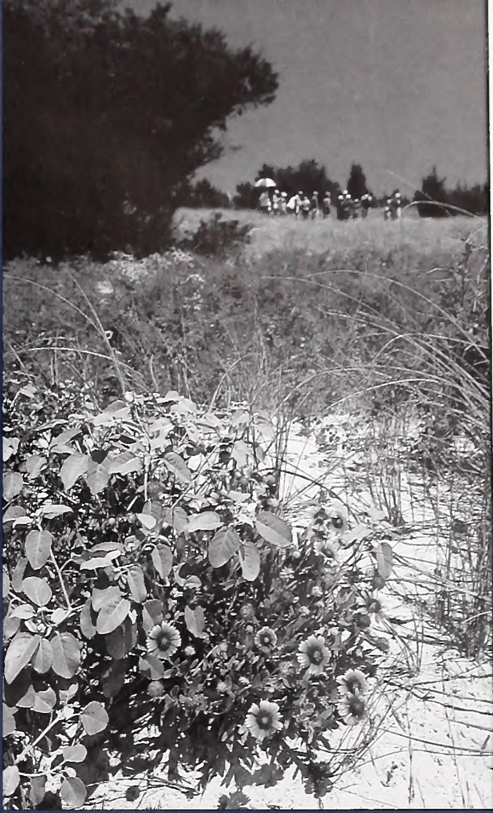
Meanwhile on the shoals, our young visitor watches the fiddler crabs burrow into the mud, then walks, ankle-deep, through clear estuarine waters to catch up with the group.

"Elevation matters in the tidal zone," John Davis is explaining. He points to the shrub thicket, surrounded by salt marsh grasses. "A small difference determines whether shrubs or trees will be the dominant habitat feature. Here we are surrounded by salt water, yet these green plants tell us there is fresh water present."

Fresh water also supports an array of wildlife, including feral horses, fox, raccoons and deer.

"The saltmarsh cordgrass is the main food source for the feral horses," Mary Ann Davis tells the group. The horses know how to avoid getting mired in the soft mud in pursuit of the delicacy. "They also know where and how to dig in the marsh to expose a freshwater lens for drinking."

The visitors may or may not get a glimpse of the people-shy horses on this trip,



LEFT: Members of the Bolo family, step off the ferry for their second adventure at the reserve. They planned their yearly beach vacation around the field trip schedule. RIGHT. Visitors are struck by the biodiversity and beauty of the state's coastal reserves — from submerged seagrass meadows and productive salt marshes teeming marine life to dune fields that manage to sustain bountiful flora, including this colorful Indian blanket.

her husband advises. "Keep your eyes open. They may surprise us."

No matter. There's a lot to observe along the carefully plotted interpretive trail.

The study group includes a grandmother from Michigan visiting North Carolina with her son's family from New Jersey. Her 9- and 12-year-old grandsons are two-time reserve "veterans," who are eager to demonstrate the best techniques for spotting prize specimens.

The roster also includes an extended family with teen-aged girls from Greensboro; a computer program analyst from Georgia, who is rediscovering his native state; and a recent college graduate from Morehead City, who is contemplating marine biology graduate studies. The 13-year-old girl, who is so fascinated with the fiddler crabs, has participated in prior coastal field trips. But, soon she'll move away to another state — far from estuary adventures.

They'll cluster around each "discovery" and eagerly learn details from the knowledgeable volunteers.

The visitors are tracing the footsteps of Rachel Carson, the reserve's namesake, who studied these very shoals and waters during research trips in the late 1930s and early 1940s. Carson's Beaufort observations are well documented in her acclaimed book, *The Edge of the Sea* about marine ecology. Her later book, *Silent Spring*, influenced how generations came to understand human impacts on the balance of nature.

Just as Carson before them, today's visitors take it all in — species, habitat, behavior: a sea squirt; sea lettuce; whelk egg cases; skate purses; spider crabs and mole crabs; tiny shrimp and shiners; coquina clams; and the "chimneys" of plumed worms.

Nine-year-old Henry Bolo is body trawling along the sandy bottom of the shallow water. He jumps up to share each find — a sand dollar with a flower-etched upper shell, or a clam with its foot protruding from otherwise firmly closed shells. His older brother, Kyle, shares a pair of moon snail egg cases resembling oversized clay bracelets.

Emily Flora, a teen from Greensboro, holds up a lettered olive for identification. Her mom, Cindy, has found an angel wing shell, but laments having no luck in her quest for a Scotch bonnet shell, the state seashell.

Mandy Uticone, a reserve intern, is taking notes and samples. Uticone is surveying the island complex for potentially invasive plant species. There is concern that the French tamarisk tree has gotten a foothold in part of the reserve and could pose a threat to other native plants. A removal plan will be implemented if the suspicion is confirmed.

"There's so much to see out here," Uticone says. "There's always something new to learn and to research."

As though to prove her point, a number of colored buoys bob in surrounding waters. They mark the locations of equipment supporting research projects at the reserve.

Research resources

As Steve Ross sees it, the NCNERR is a research laboratory as big as all outdoors. Ongoing research is crucial to developing baseline data about estuarine systems, says Ross, reserve research coordinator.

The litany of possible research topics seems endless — the effects of hurricanes on water quality, the effects of storm overwash on habitat, the relationship of water quality and fish populations, and a multitude of studies that could contribute to the state's fisheries management plans.

While the research needs are limitless, the research dollars aren't.

Continued

LEFT: From atop a high dune, Stewart Flora surveys the incredibly diverse land and waterscape of the Rachel Carson reserve.
RIGHT: Eileen Vandenburgh, another reserve fellow, is conducting research on shellfish populations in the reserve. Results could be relevant to the state's hard clam fishery management plan. She is shown here collecting samples with Jeff Smith, an IMS research technician.

"We have a lot of territory to cover, but federal dollars support research only in the state's four designated research reserves," Ross notes.

That's why the reserve staff looks to optimize research efforts through partnerships with programs, such as North Carolina Sea Grant, and university marine studies programs, including UNC-Chapel Hill and UNC-Wilmington, and NC State and Duke universities. Ross also is collaborating with the N.C. Division of Marine Fisheries to help develop coastal habitat protection plans.

For Charles "Pete" Peterson, proximity to the Rachel Carson Estuarine Research Reserve makes it an ideal setting for much of his research. Peterson, professor of marine biology at UNC-Chapel Hill's Institute of Marine Sciences (IMS), describes the reserve as "a natural laboratory of multiple habitats that are in relatively good shape."

The mixture of habitats enables scientists to study how they relate to each other. "The reserve is a place that can be a control to compare with disturbed or developed areas," notes Peterson, a North Carolina Sea Grant researcher.

Because the reserve is a well-protected area, elaborate research equipment can be set up knowing it will not be disturbed. "Lots of folks share the estuary. Local fishermen are attuned to the scientific community and respect researchers' right to be there," Peterson says.

"The reserve has stimulated research that pays homage to Rachel Carson, a true environmental hero," he says. "She set an example for all of us."

The reserve's land, marsh and waters have spawned more than 200 scientific papers and theses.

Peterson's own research in the reserve has resulted in numerous published articles through the years. Recently, he published the findings of nearly three decades of his clam recruitment studies. "The same plots showed a 60 percent decline of clam recruitment. The implication, of course, is the need to manage clam for breeding stock," he says.

Graduate fellows

One research tool Peterson and reserve officials say they would like to expand is the National Estuarine Research Reserve Graduate Fellows Program.

"It's hard to imagine another graduate fellows program that does as good a job in connecting researchers with the users and local interests at home in North Carolina," Peterson says.

Eileen Vandenburgh, a current fellow, explains that the NOAA-funded program supports research that sustains, enhances or restores estuarine ecosystem.

"My research is crucial to management of shellfish populations in all estuaries in North Carolina. I am investigating under what conditions, and on what scale, hard clam larvae recruit from areas closed to harvesting," says Vandenburgh, an IMS graduate student. Her work is relevant to the state's hard clam fishery management plan.

Monica Dozier Powers, another graduate fellow from IMS, is conducting research that could help resource managers regulate red drum fisheries stock. Powers is looking at how juvenile red drum use different types of habitat in the Rachel Carson reserve.

Powers is finding that, "Catchable fish prefer oyster reef habitat over grass or sand flats. Reef structure provides habitat for many prey items for red drum."

She also is finding that the red drum diet is selective according to age. "The diet changes as they grow, so that mature fish don't compete with recruits, or babies," she observes.

LEFT: Helen Thomas, Kelly Flora and Emily Flora display a prize specimen — a lettered olive — before returning it to the water. The trio traveled from Greensboro just to take part in the field study.

RIGHT: This porcelain crab, with its speckled white shell, makes an animated show for the field study group.

Vandenburgh and Powers plan to continue studying and challenging their own research findings. But the research fellows see the reserve as more than a place to collect data. They love its aesthetic and recreational attributes.

They also sing the praises of the educational outreach programs that bring the public into the state's reserves. Such visits, they say, help the public understand the value of protecting these environmentally important areas.

New advocates

As research coordinator, Ross also sees the value of reserve tours for the public, especially youngsters. "An appreciation for estuaries then becomes part of their culture," he says.

"Susan Lovelace, our reserve education coordinator, delivers important information in a number of ways to a broad audience, including students, teachers, the general public, resource managers and policy makers," he says.

One way Lovelace repackages reserve research findings is through Decision Maker Workshops on research topics such as riparian buffers. Future workshops will cover stormwater runoff in coastal communities.

Lovelace also takes K-12 workshops across the state. "Thanks to satellite technology and the Web, we can even take the estuary with us. For those on the other side of I-95, 'Estuary Live' is the next best thing to being here."

Estuary Live 2002 connected eight estuarine sites in eight states to the nation with support from NOAA and the National Estuarine Program.

The same satellite technology was adapted for "Coast Live," an interactive workshop that convened academia, state health professionals and coastal managers to share important information on the transport of fecal contaminants.

"We are committed to doing as much educational outreach as possible," Lovelace says. "With rapid changes in the coastal area, we really can't begin to predict the impacts of human populations on our estuarine resources. We need to find ways to minimize our effects so that we can continue to enjoy seeing them, eating from them and being in them."

Meanwhile visitors to the Rachel Carson reserve are exchanging the day's highlights. Judging from the excited chatter near the boat landing, they already have become staunch NCNERR advocates.

As they discuss their most memorable discoveries, a fox appears in a clearing. He pauses, then darts into the cover of the nearby thicket, invoking an excited murmur from the group.

Then, as though his curiosity could not be contained, a wild horse steps out from behind a veil of trees to see what the excitement is about. He watches for a moment and disappears again behind the tree line.

"Now I have two new highlights of the day. Seeing the horse and the fox," Kyle says. A chorus of agreement follows from the group.

As for Christie Stevens, she's sticking with her first — and most memorable — experience of the day: "Herding fiddler crabs!" ◘

For information about the North Carolina Estuarine Research Reserve Program, contact John Taggart at 910/395-3905; or Susan Lovelace at 919/252-2170. Go online to www.ncnerr.org *to find out about programs and to tune into "Estuary Live," winner of the Governor's Award for educational technology.*

EELGRASS:
Binge Eaters in the Estuary

By Pam Smith

Photos courtesy of the North Carolina State University Center for Applied Aquatic Ecology

Eelgrass is a nitrogen junkie.

That's no laughing matter, says Brant Touchette, since the ecologically important seagrass quite literally can eat itself to death in nutrient-enriched estuarine waters.

Findings from Touchette's eelgrass research provide new insights into the metabolism of seagrasses — perhaps a key to solving the disappearing eelgrass mystery.

Eelgrass, a submersed aquatic plant, plays an important role in the estuarine nursery. It provides habitat for aquatic life, and it helps increase water clarity and lessens erosion by reducing wave energy and trapping loose sediments, says Touchette.

In recent decades, there has been a widespread decline in eelgrass.

"Where we see declines in eelgrass habitat, we usually see declines in commercially valuable finfish and shellfish populations," explains Touchette, an assistant professor of biology at Elon University.

Touchette conducted his eelgrass work while completing doctoral and postdoctoral studies at North Carolina State University's Center for Applied Aquatic Ecology. Articles based on his North Carolina Sea Grant-funded research have been published in several scientific journals.

Building on the previous work by center researchers, including director JoAnn Burkholder, Touchette conducted his field work in the estuarine waters surrounding the National Oceanic and Atmospheric Administration's Beaufort Laboratory. Submerged eelgrass beds there provide abundant samples for both field observations and controlled lab experiments.

Touchette's study shows that eelgrass leaves will take up nitrate at all costs.

"Seagrass is nitrogen limited, so it is geared to recognize nitrogen going through the water column," Touchette explains.

"A little nitrogen is a good thing. But, eelgrass is a nitrate junkie. It will deplete its growth effort to go after nitrate."

Unlike other plants that have control mechanisms, eelgrass has no turn-off switch. It therefore uses all its energy to go after nitrate from the water — energy that should go towards its growth, development and sugar production.

Eelgrass can't stop taking up nitrate until it runs out of soluble carbohydrates.

In a controlled lab setting, Touchette could manipulate the amount of nitrogen in the water column to observe its affects on the eelgrass.

"It's amazing to see what occurs with increased nitrate levels," he says. "The leaves break off, the main growing area crumbles, and the plant begins to deteriorate. Its growth is stunted."

Another surprise finding is that eelgrass takes up nitrate from the water column day and night. In laboratory experiments, Touchette found that the activity of the key enzyme in nitrate assimilation — nitrate reductase — was induced during dark periods, as long as nitrate was available in the water column.

Most other plants shut down at night, since the sun produces the energy needed for photosynthesis, he notes.

Continued

ABOVE: Brant Touchette is ankle-deep in estuarine waters surrounding the NOAA Beaufort Laboratory — a prize spot for eelgrass. RIGHT: Sea Grant researchers are making important discoveries about submersed seagrasses, critical links in the estuarine foodchain. Specimens shown here are growing at the North Carolina State University Center for Applied Aquatic Ecology.

Brant Touchette examines eelgrass growing in controlled environments.

"Eelgrass doesn't follow that model. Just why it has not evolved a mechanism to shut down at night is a question for another day," he muses.

Contributing factors

A widespread eelgrass die-off stunned scientists in the early 1930s. The so-called "Wasting Disease" decimated about 90 percent of all eelgrass in northern Atlantic waters. On the east coast, the eelgrass growing range extends from the Arctic Circle to North Carolina.

Scientists have proposed many theories as to the cause — bacteria, fungus, and mold. But the literature records several previous eelgrass declines, and some suggest that periodic sunspots might be to blame. Others have correlated periods of above average precipitation with the decline, while still others have suggested the decline could be drought-related.

Another theory points to increased water temperatures as a contributing culprit — something that Touchette also considered in his recent research.

His lab experiments show that an increased temperature can reduce eelgrass shoot density by about 40 percent. Temperature also may decrease leaf and root development, and may alter internal carbon and nitrogen compositions.

But Touchette is not ready to draw any correlation between global warming and the current decline of eelgrass. "The jury is still out on that," he says.

However, he is willing to stick his neck out and name names when it comes to contributing factors to nutrient loading and eelgrass loss.

"There is an obvious need to control point and nonpoint pollution. Better stormwater management is a big step, since historically storms mean high concentrations of nitrogen in runoff," Touchette says. Also, sediments, which begin as ammonia compounds, may oxidize into nitrate in the water column.

A National Research Council report states that more than 60 percent of U.S. coastal rivers, estuaries and bays are moderately to severely degraded by nutrient overenrichment, says Burkholder, co-investigator of Touchette's eelgrass research.

She says that Touchette's findings are important in helping scientists, coastal managers and concerned citizens understand that eelgrass, a valuable seagrass on the U.S. Atlantic coast, is extremely sensitive to nitrate pollution.

"From bypasses of raw sewage into coastal waters during moderate rainstorms, to poorly treated animal wastes that spill into waterways, to urban runoff from our sprawling and densely populated coastal cities, water pollution control should be a much higher priority," Burkholder says.

"Some may say it's impossible to eliminate all sources of pollution," Touchette observes. "It's true that pollution is not easily managed. But one of the many consequences of not trying to do more could be the disappearance of eelgrass beds, along with many of the economically important fisheries they host."

Eelgrass evolved long ago before modern levels of pollution existed, explains Burkholder. Eelgrass forms underwater meadows where young fish can hide from predators and find a wealth of food to eat.

"The enormous surface area provided by these plants also acts as a highly efficient biological filter that removes harmful pollutants from the water, helping to protect fish health. Whether we live along the coast or inland, we all depend on eelgrass meadows to produce many of the marine fish that we use for food," says Burkholder.

Essential habitat

There's a growing body of data to show the importance of eelgrass and other submerged aquatic vegetation in the lifecycle of commercial and recreational fish, says Carrie Selberg, a habitat specialist with the Atlantic States Marine Fisheries Commission in Washington, D.C.

"Essential fish habitat is more than a buzz phrase," she says. "Many fish spend part of their lives in seagrass habitat. For some it's a place of refuge where they can find cover from prey. Others dine on the organisms trapped on waves of grass. Some species spawn in the quiet waters."

Selberg, who earned her master's degree in 1999 from Duke University's Nicholas

School of the Environment in Beaufort, is quite familiar with the area waters. Some North Carolina species rely on eelgrass habitat for part of their lives, she says.

"North Carolina is looking at how all submerged aquatic vegetation figure in coastal habitat protection plans (CHPPs) being developed by the N.C. Department of Environment and Natural Resources (DENR)," says Selberg.

North Carolina is taking a unique approach with these plans, and other states are interested in seeing how the process works, she says. Results from studies, such as Touchette's, could shed an important light on seagrass systems — what they contribute to the overall fish habitat, and how they are impacted by human activities, Selberg points out.

Mike Street, chief of the habitat protection section for the N.C. Division of Marine Fisheries, is coordinating the CHPP effort.

He says submerged aquatic vegetation, such as eelgrass, are important for food, cover, spawning and migration corridors. Known in scientific shorthand as SAVs, they are one of the six habitat types that are being considered as DENR develops protection plans. Other habitat types are the water column, shell bottoms, wetlands, ocean hard bottoms, and soft estuarine and riverine bottoms.

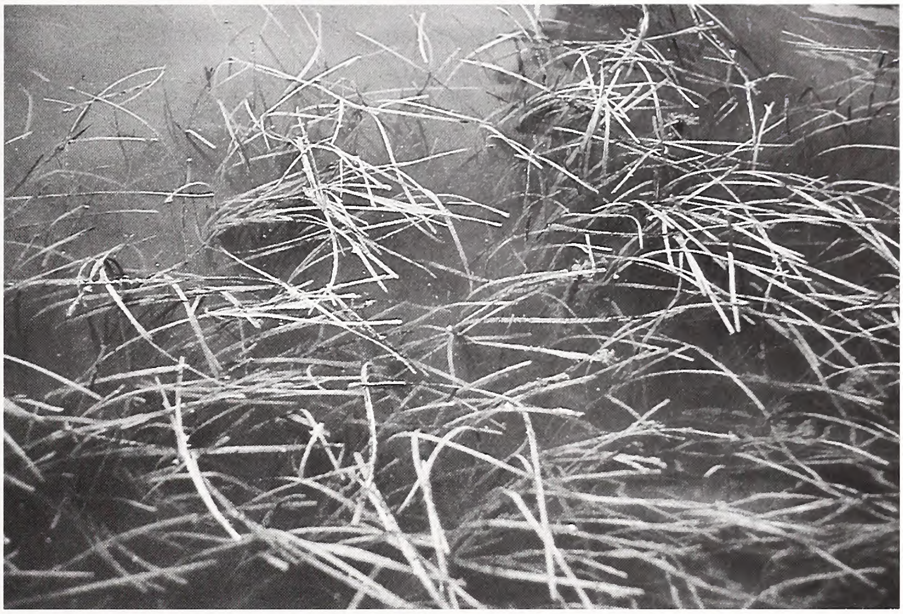
"We want to show the links between each habitat, habitat function and the lifecycle of fish," Street says. "It's a huge task. But it is extremely important to develop habitat protection plans that can be used as management tools."

Reliable scientific data to support each area is vital, he says.

Mark Fonseca, research ecologist at the NOAA Beaufort Lab, agrees with other colleagues who consider seagrasses "the canaries in the estuaries."

"If the seagrasses are in good shape, it's a pretty good sign that the water quality is in good shape," Fonseca points out. "In North Carolina, they seem to be in relatively good shape, except in localized trouble spots with high population and land runoff problems."

Interestingly, North Carolina is on the boundary of two types of important seagrasses — the southernmost boundary for eelgrass and the northernmost boundary for shoal grass.



Eelgrass meadows play an important role in the estuarine habitat, providing food, cover and spawning grounds from many important finfish and shellfish.

This is the only place Fonseca knows of where these subtropical and temperate species overlap growing seasons.

He has studied and published on a variety of seagrass-related topics, ranging from faunal utilization to economics and hydrodynamics.

Like Touchette, he is fascinated with the physiology of seagrasses. "Here they are, downstream of everything — their roots fixed in a bottom of sediments that have sulfides that are naturally toxic to rooted plants. Yet, they somehow manage to produce," Fonseca says.

Unsolved mysteries

Touchette agrees that, when it comes to submerged aquatic vegetation, there is cause for wonder — and a need for additional studies.

"Seagrasses have evolved to tolerate harsh environmental conditions. And, while there is a wealth of literature about terrestrial plants, comparatively little is known about seagrasses," Touchette observes.

The necessary adaptations for survival and growth probably have altered many physiological processes in these plants. He would like to have a hand in finding the scientific explanations for remaining eelgrass mysteries, including photosynthesis and carbon metabolism; the role of carbohydrates; and the role of carbon storage.

"I would like to culture seagrass in the lab and look at how the genes involved in nitrogen uptake are regulated," he says. "Under lab conditions, you might begin to get a handle on the nitrogen carbon interrelations and perhaps determine if what you are seeing is genetic- or energy-related."

Touchette loves research and loves teaching. To him, they are interrelated: His students' curiosity inspires research, and his research results find their way into his teaching. ◘

For information, email Touchette at btouchette@elon.edu. To read his journal articles, go online to the Center for Applied Aquatic Ecology homepage at www.pfiesteria.org *and click on publications.*

Seafood Dishes Are Tasty Holiday Fare

By Ann Green
Photos by Ken Taylor

Would you like to add some spark to your holiday dinner? Seafood dishes offer a tasty alternative to the traditional turkey dinner. They also can be easy to prepare — and be made with seafood caught in North Carolina waters.

Start off the festive occasion with a delicious shrimp dip or shrimp mousse. For the main course, bake a spicy creole red snapper.

"Make sure the fish is fresh," says Marlene Hieronymus, executive chef at Hieronymus Seafood Restaurant and Fresh Market in Cary. "You can tell how fresh the fish is by the gills. If the gills on a snapper are yellow, it is old. The gills need to be red."

For another dish, bake cornbread-oyster dressing. Oysters are in season in North Carolina October through April. Then cook your favorite vegetable. Finish the meal with a scrumptious praline pumpkin cheesecake.

Following are recipes from Hieronymus, who, along with her husband, has been in the seafood business for many years. She teaches cooking classes at the Cary restaurant.

SHRIMP DIP

- 8-ounce package cream cheese
- 6 ounces sour cream (more if you like thin dips)
- 1 small diced green pepper
- 1 small diced onion
- 3 tsp. mayonnaise
- 2 cups peeled, deveined and cooked shrimp (1 pound)

Mix all ingredients well and chill overnight.

SHRIMP MOUSSE

- 1 package unflavored gelatin
- 1/2 cup hot water
- 1 10 3/4-ounce can condensed tomato soup
- 1 cup mayonnaise
- 8-ounce package cream cheese
- 1 1/2 cups chopped celery
- 1/2 cup chopped onions
- 1/2 pound whole shrimp, cooked and cleaned

Dissolve gelatin in hot water. Heat tomato soup. Mix mayonnaise, cream cheese, celery, onions and shrimp. Pour gelatin mixture into heated soup. Combine all ingredients. Pour into 5-cup mold. Makes 8 to 10 appetizer servings.

CREOLE RED SNAPPER

- Red snapper
  (5 or 6 pounds feeds up to 10 people)

Stuffing:
- 1/4 cup chopped onions
- 1 stalk chopped celery
- garlic (optional)

Creole Sauce:
- 1/4 cup olive oil
- 2 1/2 cups finely chopped onions
- 1 3/4 cups finely chopped celery
- 1 1/2 cups chopped green bell pepper
- 4 Tbs. unsalted butter
- 2 tsp. minced garlic
- 1 bay leaf
- 2 tsp. salt
- 1 1/2 tsp. white pepper
- 1 tsp. red cayenne pepper
- 3/4 tsp. black pepper
- 1 tsp. dried thyme
- 1 1/2 tsp. sweet basil leaves
- 3 cups finely chopped, peeled tomatoes
- 1 1/2 cups canned tomato sauce
- Dash of Tabasco sauce
- 2 tsp. sugar

Heat olive oil over medium heat in a 4-quart saucepan. Add 1 cup of onions and cook 3 minutes. Cook onions until they are a rich brown color. Add the remaining onions, celery, green bell pepper and butter. Cook over medium high heat until the pepper and celery are tender, about 5 minutes, stirring occasionally.

Add the garlic, bay leaf, salt and peppers; stir well. Add Tabasco, thyme and basil. Cook over medium heat for about 5 minutes to allow seasonings to marry and vegetables to brown further. Add tomatoes. Turn heat to low and simmer 10 minutes, stirring occasionally. Add tomato sauce and simmer 5 minutes. Add sugar. Simmer 15 minutes. Cool, then refrigerate. Serve the next day for best flavor.

Fish and Stuffing:

Before cooking the fish, score it with a knife. Make sure the gills are out. Brown onions in olive oil. Add garlic and celery. Stuff fish with onions, celery and garlic.

Place fish in pan. Pour creole sauce over fish. Bake at 450 degrees for 15 to 20 minutes per pound.

CORNBREAD-OYSTER DRESSING

- 1 cup water
- 1 1/2 cups (3 sticks) butter or margarine
- 2 8-ounce packages cornbread-stuffing mix
- 2 pints fresh oysters,
  or 3 cans (7-ounce size) frozen oysters
- 1/2 cup chopped onion
- 1/2 cup chopped green pepper
- 1/2 cup chopped celery
- 1 tsp. salt
- 1/2 tsp. rosemary leaves
- 1/2 tsp. pepper

In a 6-quart dutch oven or kettle, heat 1 cup of water and 1 cup of butter until the butter is melted. Remove from heat. Add stuffing mix. Then toss to mix well.

Drain oysters and cut each in half. In a medium skillet, sauté the oysters, celery, green pepper and onion in the remaining butter until the onions are golden brown (about 5 to 7 minutes). Stir in salt, rosemary and pepper.

Add oyster and onion mixture to stuffing mixture. Toss lightly until well-mixed. Put butter on top of dressing and bake at 450 degrees for 35 minutes until top is brown. Makes 12 cups.

PRALINE PUMPKIN CHEESECAKE

Graham Cracker Crust:
- 1 1/3 cups graham cracker crumbs
- 1/3 cup brown sugar
- 1/2 tsp. cinnamon
- 1/3 cup melted butter

Combine graham cracker crumbs, brown sugar, cinnamon and melted butter. Blend all ingredients. Press into two greased 10-inch springform pans and refrigerate.

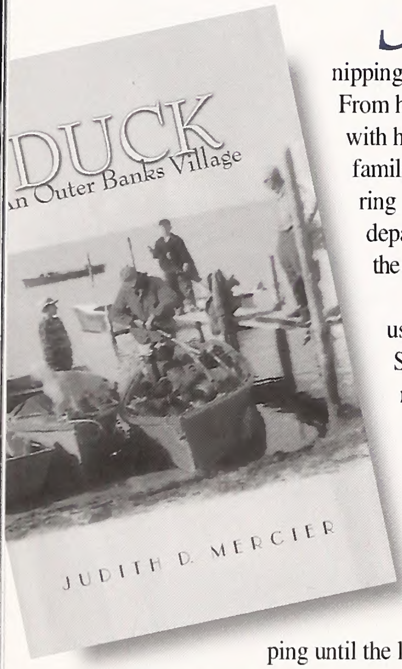
Filling:
- 1 can plain pumpkin filling
- 1 tsp. cinnamon
- 1 tsp. nutmeg
- 1 tsp. allspice
- 1 tsp. ginger
- 6 8-ounce packages cream cheese
- 1/4 cup flour
- 1 cup granulated sugar
- 2 cups brown sugar
- 1 tsp. lemon juice
- 1/4 tsp. vanilla
- 3 eggs, beaten
- Chopped pecans

Mix cream cheese with beaten eggs, vanilla, lemon extract and lemon juice. Then add the flour, pumpkin, spices and combined sugars. Pour over prepared crusts. Sprinkle top with pecans. Bake at 250 degrees for 2 1/2 hours or until done. Cake will rise slightly. Place a pan of water in the oven so that there is sufficient moisture to keep the cake from becoming too dry. Cool cake overnight. Makes two cakes. Can wrap cheesecake in aluminum foil and freeze. Keeps in freezer for three months. ◘

Marlene Hieronymus uses fresh seafood for her tasty recipes.

BOOKS: Lasting Holiday Gifts

By Robin Sutton



Jack Frost is nipping at our noses. From houses decked with holly to the familiar carols that ring out in bustling department stores, the holidays are here.

For most of us, the abundant Santa Clauses and newspaper ads are reminders of the spirit of giving — and our mile-long shopping lists. If you've put off shopping until the last minute, or there are certain family members and friends who already have everything, not to worry. Consider the selection of books about the North Carolina coast — any of which would appease even Blackbeard and his host of pirates.

Come to think of it, why not wrap one for yourself. That way, when all the shopping is complete, and the weather outside looks frightful, there's time to find a cozy chair and your gift to yourself.

- **Duck: An Outer Banks Village,** *by Judith D. Mercier, published by John F. Blair, Winston-Salem, NC 27103. 259 pages. Hardback, $18.95, IBSN 0-89587-236-6.*

For many beach-goers, thoughts of the coast call up images of sunny shores packed with colorful umbrellas and tourists crowded in expensive resorts. But for Judith Mercier, the beach represents much more than quickly built shopping marts, over-priced restaurants and amusement parks.

In the summer of 1989, Mercier and her family first arrived at Duck. And almost immediately, the small Outer Banks village became a sanctuary for her.

Within her book, Mercier tells the story of an unforgettable community that dates back to the 17th century. Beginning with tales of early European colonists who struggled with and against the area's brute storms, she tells about one of the area's most lucrative businesses to date.

Townspeople made a living from the seas' natural and man-made treasures. Wreckage from great ships or the whales that washed ashore were profitable enough for the people to live, but this business, like the sea, was unreliable.

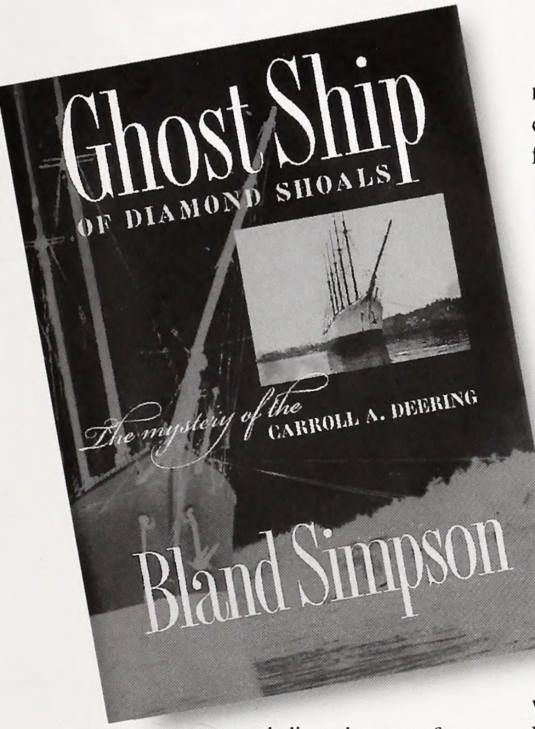
Through personal narratives and yarns from the locals, Mercier tells how the small town still relies on the sea more than three centuries later. Yet, just as storms have transformed the shape of the island, development has changed the small town that has been the locals' home for years. Every year, swarms of summer tourists far outweigh the natives.

In *Duck,* Mercier relates the townspeople's opinions, especially those of the "old-timers" who know that "their Outer Banks village holds no certainties," and that "only change is inevitable." Mercier has captured the story of a transforming small town that attempts to reconcile its past while preserving its future.

- **First to Fly: North Carolina and the Beginnings of Aviation,** *by Thomas C. Parramore, The University of North Carolina Press, Chapel Hill, NC 27515. 372 pages. Hardback, $29.95, ISBN 0-8078-2676-6.*

For nearly a century, North Carolina has been known for its prowess in the sky. Our state's license plate boasts of Orville and Wilbur Wrights' first powered flight in 1903, but what many of us don't know is that North Carolina's history with flight traces way back to tales of ballooning adventures just outside Winston-Salem in 1789.

In *First to Fly: North Carolina and the Beginnings of Aviation,* Thomas C. Parramore has pieced together stories from newspapers, books and magazines, as well as treasured personal family papers, to tell the story of a state



dedicated to one of our world's highest achievements. If not for the help of North Carolinians — and Outer Bankers in particular — the miracle of flight may not have been achieved in America, Parramore convincingly argues.

North Carolina contributed much more than a plot of land that could be used for flight practice. Our state produced some of the most notable airwomen and airmen.

In World War I, hundreds of pilots came from North Carolina, including the first American to shoot down an enemy plane.

In the few years that followed the Wright brothers' famous flight, "it seemed unlikely that airplanes would be much consequence to human existence," Parramore writes. However, published on the dawning of the flight's 100th birthday, Parramore's book celebrates a rich past in a compelling story that is just right for any history buff.

- **Ghost Ship of Diamond Shores,** *by Bland Simpson, The University of North Carolina Press, Chapel Hill, NC 27515. 256 pages. Hardback, $24.95, ISBN 0-8078-2749-5.*

Bland Simpson's *Ghost Ship of Diamond Shoals* is another must-read for history lovers, as it describes the real-life mystery of the *Carroll A. Deering*, a great cargo ship whose past has haunted historians for more than a half century.

Willis Wormell, captain of the *Deering*, had retired when he received a telegram from the ship asking if he'd make one more run. The scheduled captain had become ill, but the *Deering* needed to make a trip to Rio de Janeiro, Brazil. So Wormell said goodbye to his wife and daughter, Lula, and left for Rio. Though aware of the dangers of the sea, "a man just couldn't give up all he'd known and done and followed for his whole life" after he retired, said his wife. And just as he'd always returned, she didn't expect this time to be any different.

But on Jan. 31, 1921, an abandoned schooner was seen wrecked on the treacherous Diamond Shoals. When rescuers were finally able to approach the ship, they found it both plundered and deserted. Only a cat still occupied the ruined ship.

Several months later, a bottle was found on the shore not far from the spot of the wreckage. The soggy note that was enclosed appeared to be written by one of the crewmembers and claimed that pirates had captured the ship.

When Lula Wormell brought her suspicions of foul play to then-secretary of commerce Herbert Hoover, a worldwide investigation commenced. Rumors of mariners' mutiny and murder followed. Through the articles of W.O. Saunders, editor of Elizabeth City's newspaper, the *Independent*, as well as letters from Lula Wormell, FBI reports and ship's logs, Simpson unravels an investigative mystery that is still alive today.

- **A Guide to Nature Conservancy Projects in North Carolina,** *written and edited by Margaret Fields and Ida Phillips Lynch, published by The Nature Conservancy, N.C. Chapter, Durham, NC 27707. 129 pages. Paperback, $9.95, ISBN 0-9675026-0-8.*

For the adventurous outdoorsman or the avid traveler on your list, consider *A Guide to Nature Conservancy Projects in North Carolina.* Compiled by the Nature Conservancy — a nonprofit organization dedicated to protecting the natural areas that plants and animals need to survive — the colorful guide highlights 50 of our state's conservation lands that are most accessible to outdoor enthusiasts. The guide is divided into four sections, each one highlighting a different region of our state.

From entries on the coast to the mountains, each passage brims with pictures, as well as easy-to-interpret symbols that give information about hiking, camping and fishing opportunities, along with hints on boating or bird watching. Each section provides facts on the size of each preserve or project, and highlights its history with the Nature Conservancy.

No matter where you're bound in North Carolina, the Nature Conservancy's guide is certain to feature a site close by. We recommend keeping a copy of this book in your glove compartment, so that a long trip to the mountains may be broken up with a picnic lunch at the Eno River State Park in Durham. Or a trip to the coast could incorporate bird watching at Nags Head.

Whether you plan your trip around a Nature Conservancy preserve, or you just want to stretch your legs with a short walk amid a shady trail's colorful wildflowers, this guide is a must-have for locating our state's unique natural treasures. ◘

Sea Grant

NORTH CAROLINA SEA GRANT
NORTH CAROLINA STATE UNIVERSITY
BOX 8605
RALEIGH, NC 27695-8605

ADDRESS SERVICE REQUESTED

PERIODICALS
POSTAGE PAID
AT RALEIGH, NC

424 M7 P 608
05/14/07 45118

COASTWATCH

STATE LIBRARY OF NORTH CAROLINA
3 3091 00767 5390